TECHNOLOGY DEPT.

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July 1957

Grinding and Finishing

grinding / honing / lapping / polishing / barrel finishing / abrasive cutting / gaging / buffing

In this Issue:

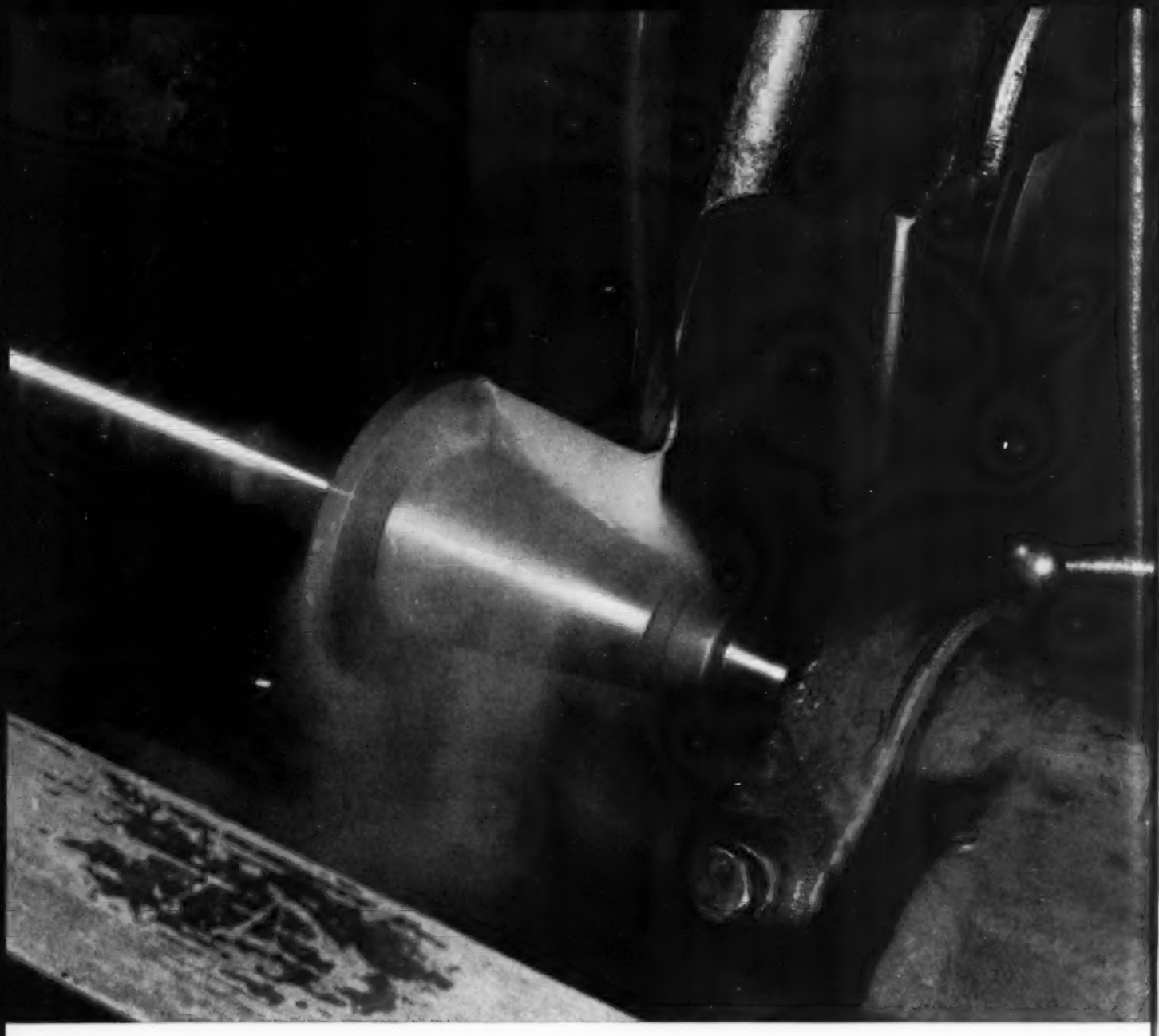
Eight Ways to Clean Grinding Coolants —page 21

Belt Grinder Finishes SAGE panels —page 26

Getting the Most from Your Abrasive Belts —page 37

Finishing printed circuit boards at IBM —page 26

a hitchcock publication



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Contents • July 1957

Grinding and Finishing

the magazine of abrasive metalworking operations

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Summarizing the most important methods of filtration and separation of solids from grinding fluids. By A. S. Harlan

Multiple-Belt Grinder Finishes SAGE Panels 26
Production of copper-clad circuit boards for the complex SAGE defense computer has been speeded by use of over-and-under belt machine.

Horizontal Spindle Surface Grinding 29
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Getting the Most from Your Abrasive Belts 37
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How to Dispose of Soluble Coolants 43
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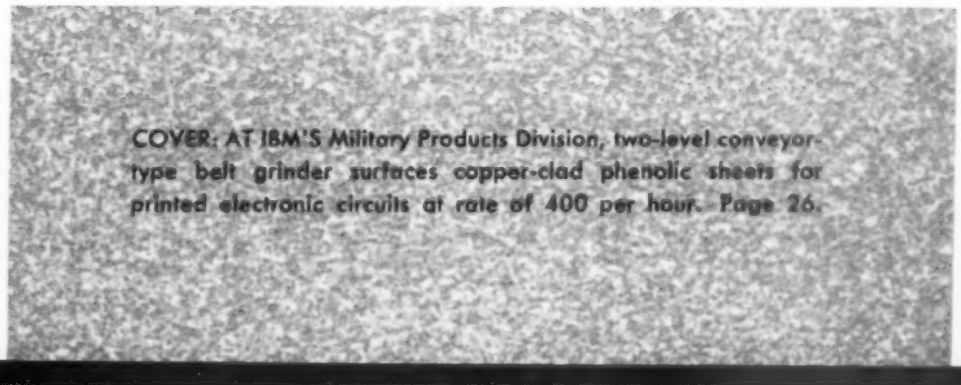

COVER: AT IBM'S Military Products Division, two-level conveyor-type belt grinder surfaces copper-clad phenolic sheets for printed electronic circuits at rate of 400 per hour. Page 26.

Cincinnati Combines Quality Control and

for Your Precision Centertype Grinding

Every shop wants closer control of quality and production. It's especially desirable for final operations, when cost per unit nears its maximum. In the field of precision centertype grinding on 6" to 14" machines, CINCINNATI'S® standard and extra features combine quality control and production control into a unified, automatic function of the machine. You will be interested in knowing why:

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*Automatic Air-Electric Gage Sizing incorporates cycle time stabilizer. As the wheel wears, original length of cycle is automatically maintained.

The non-productive time spent in "cutting air," occasioned by variations in grinding stock, is greatly reduced by the *Gap Eliminator feature. The actual grinding rate starts only when the wheel contacts the work.

The above cost-control features and many others are outlined in two attractive catalogs: No. G-660-1 for the CINCINNATI FILMATIC 6"R and 10"L Plain Hydraulic Grinding Machines. No. G-661 for the 10"R and 14"L Machines. Write for copies, or look in Sweet's for brief specifications.

*Extra Cost

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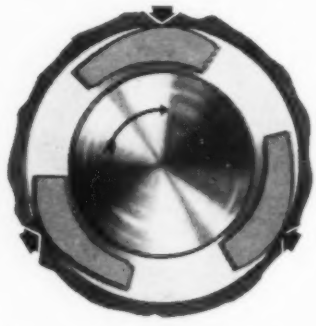
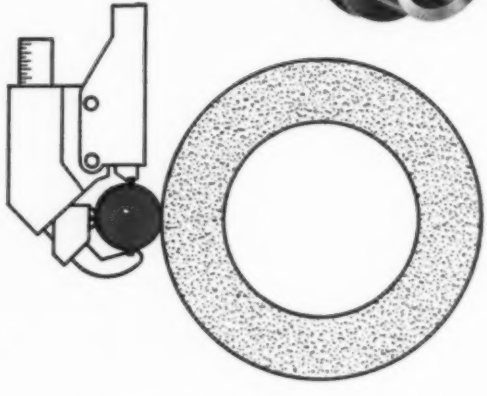


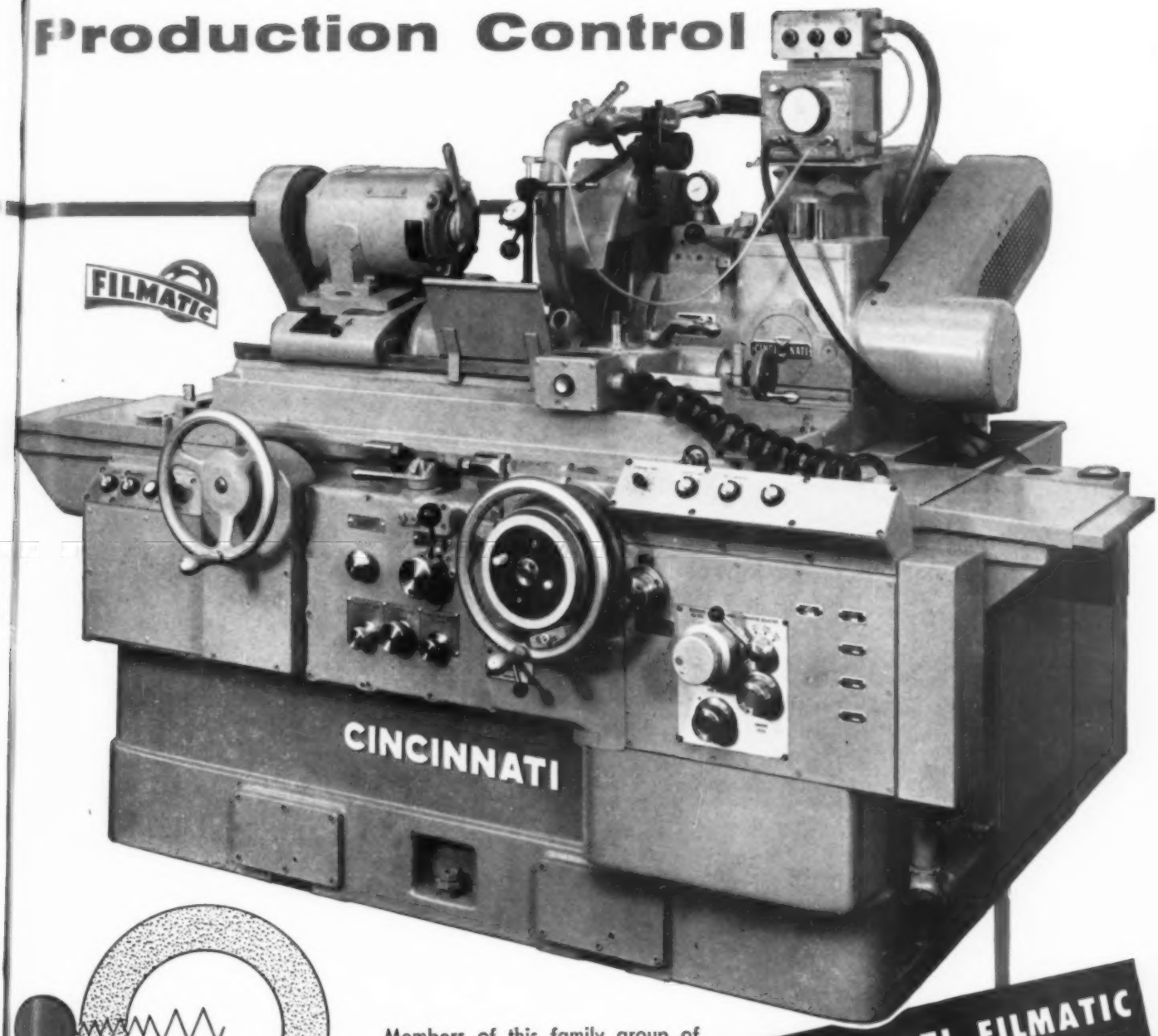
FILMATIC Grinding Wheel Spindle Bearings and Grinding Wheel Balancing are standard equipment. (FILMATIC principle illustrated above.) These two cost-reducing features alone are reason enough to choose CINCINNATI.

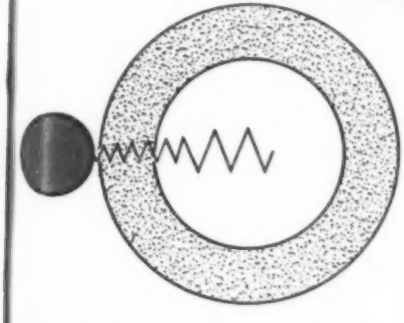


Automatic Air-Electric Gage Sizing (extra) includes an exclusive CINCINNATI advantage . . . cycle time stabilizer for wheel wear and truing.

CINCINNATI

Production Control





Gap eliminator . . . greatly reduces time spent in "cutting air" during automatic in-feed grinding operations. (extra)

Members of this family group of CINCINNATI® FILMATIC Plain Hydraulic Grinders are:

Size	Between-Center Lengths	Catalog
6"R 10"L	18" and 30"	G-660-1
10"R 14"L	18", 36", 48" 72" and 96"	G-661

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Letters to the Editor

Society for Abrasives

I extend my thanks to you for the hospitable receipt of the Society's initial release, and particularly for the splendid editorial comment on the founding of American Society for Abrasives.

Your editorial will, I am sure, be of tremendous help in getting the Society on its feet, and while you withheld a blanket and unconditional endorsement of the Society and its future, I . . . can assure you that the only thing in the minds of the officers and directors is to convert the purposes expressed into fact. We are aware that time, travail, and sweat are needed, and we plan to supply them without stint.

Jan L. Deelman, Secretary,
American Society for Abrasives
222 Berks County Trust Bldg.
Reading, Penna.

Surface Grinding

If tear sheets or reprints are available, we should like to obtain three copies of the article entitled "Horizontal Spindle Surface Grinding" which appeared on page 35 of the May issue of your publication.

This article holds particular interest for us and the extra copies requested would be most helpful.

H. M. Metcalfe
Technical Library
Magnetic Metals Company

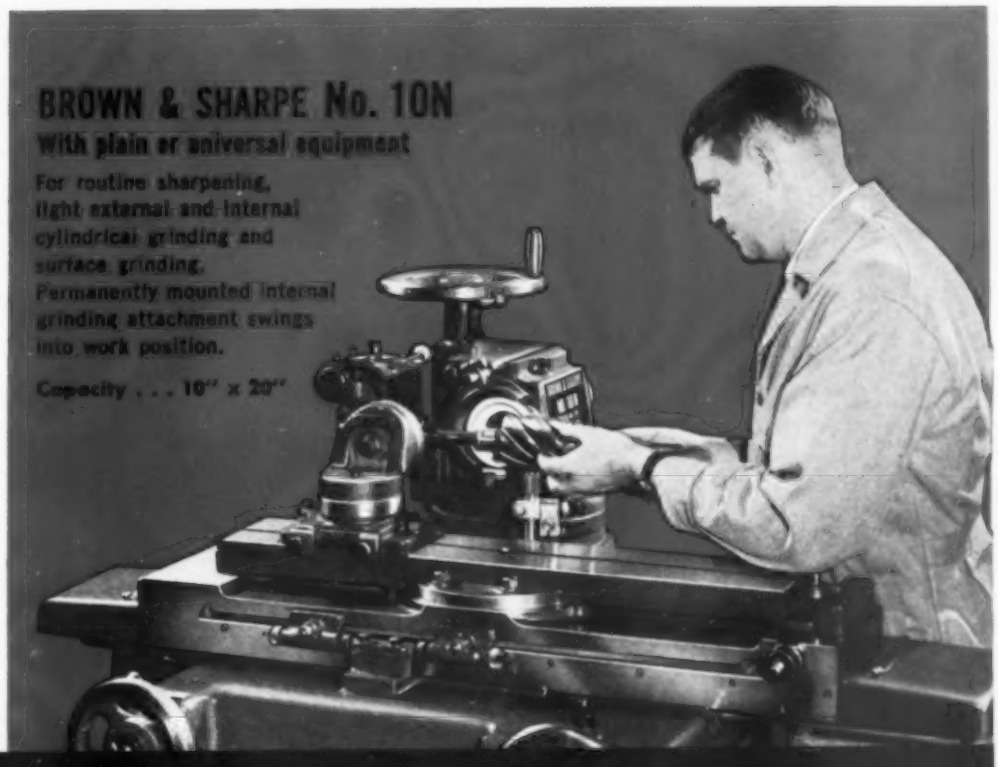
Tear sheets of the Surface Grinding series are available only in limited numbers. If demand for the series continues high, reprints of all five articles will be made.—Ed.

Finds GF Helpful

Please send me a copy of:

1. Developing Standard Time Data for Grinding Operations ($1.00 check enclosed)
2. When & How you can use

(*Continued page 6*)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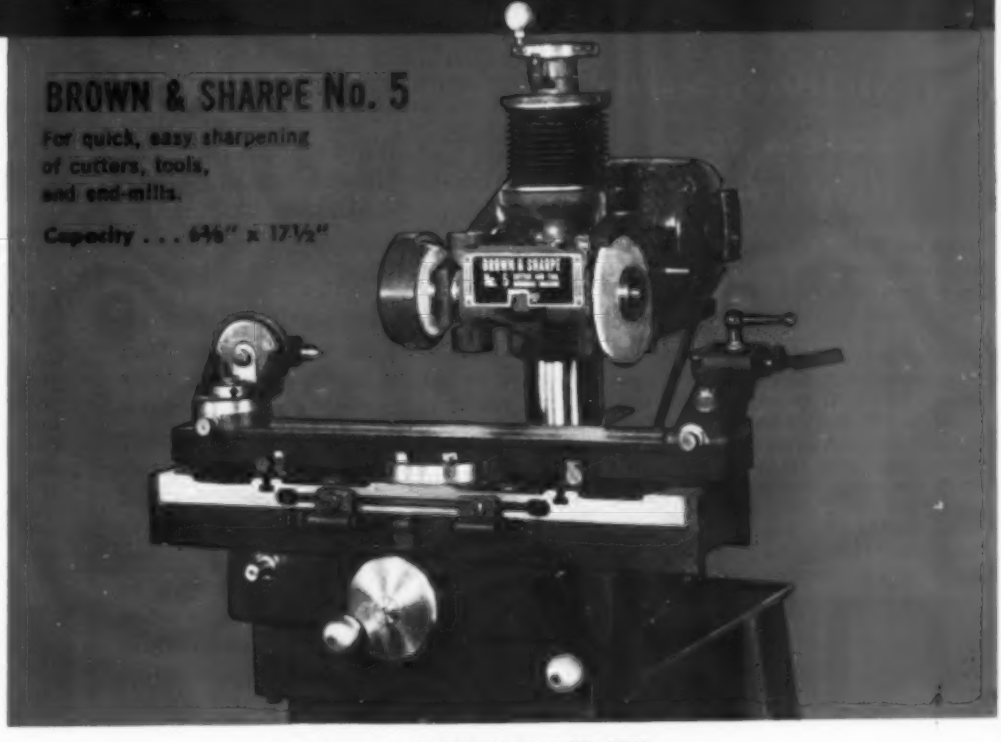

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Letters . . .

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I read your publication regularly and find it very helpful and informative.

F. G. Orth
Industrial Engineer
Split Ballbearing
Division of MPB, Inc.

Crush Form Grinding

Please send me your free copy of "When and How You Can Use Crush Form Grinding". Thank you.

Charles Nuese
Machine Shop Foreman
Raybestos-Manhattan, Inc.

Standard Time Data

Grinding and Finishing has proven to be of great value to our shop operations and we look forward to each issue.

Various individuals in our shop have expressed a desire to have complete copies of developing standard data on grinding operations since our single issue is shopworn.

Please send five (5) copies of the reprint on Standard Time Data to us when it is available.

Bud Weis
Asst. Superintendent
Wilmington Plant
The Cincinnati Milling Machine Co.

Disturbing Item

That "disturbing item" you referred to on page 16 of your May '57 issue—perish the thought. How any democratic thinking person could possibly favor such a policy is beyond comprehension. No matter what reason the Department of Defense might have; any attempt to restrict dissemination of any new ideas, whether they be related to metal working, electronics, or what have you, is a positive and certain step towards technological retrogression. Let's hope that someone within the Department has enough intelligence, foresight, or whatever is needed, to either eliminate or change the policy thinking on matters such as this.

Richard Paulson
La Jolla, California

When your prospects are ready to buy —they reach for Hitchcock's Machine and Tool DIRECTORY. That's when your sales message must be there—*at the point of purchase.* That's why this "most helpful and most frequently used" buyer's reference is a *must* in your marketing plan if you are to get your maximum share of the big metalworking market.
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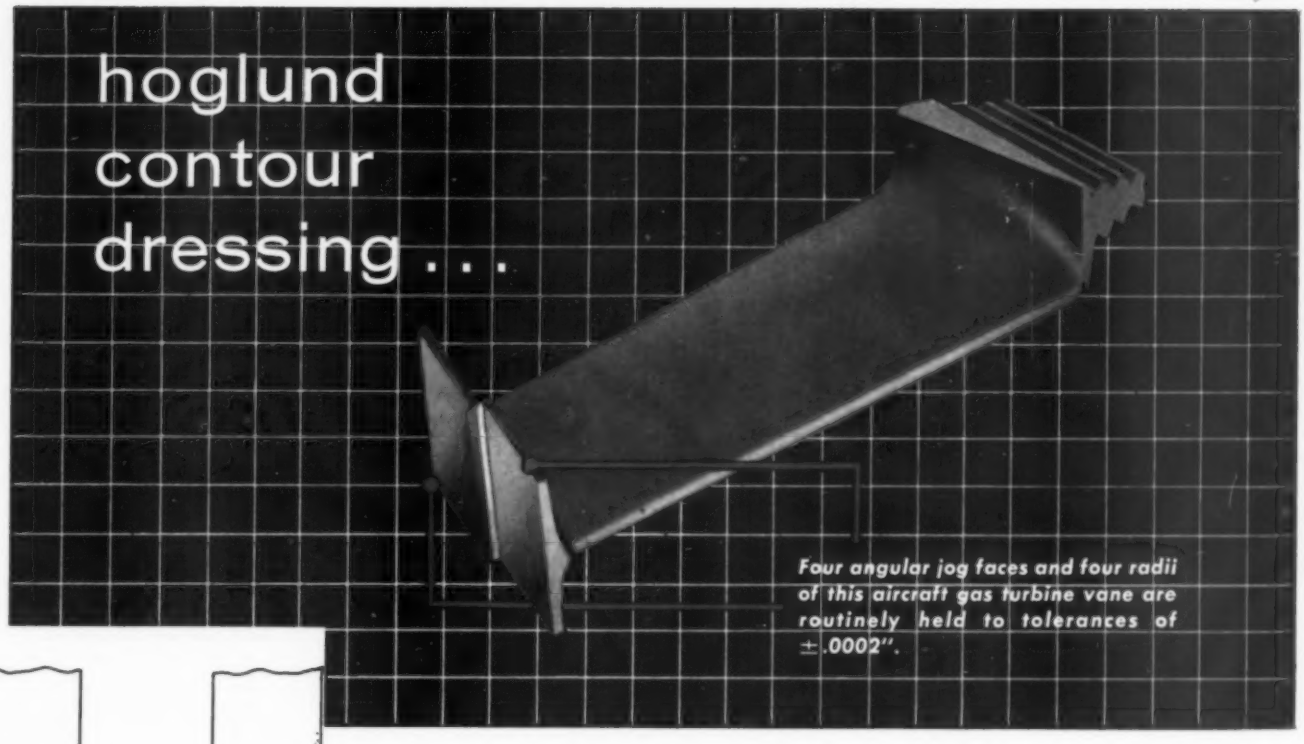
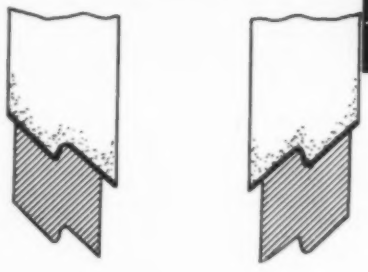
hoglund contour dressing . . .

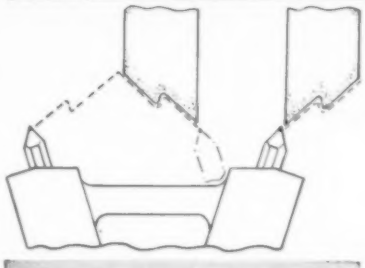


Four angular jog faces and four radii of this aircraft gas turbine vane are routinely held to tolerances of ±.0002".

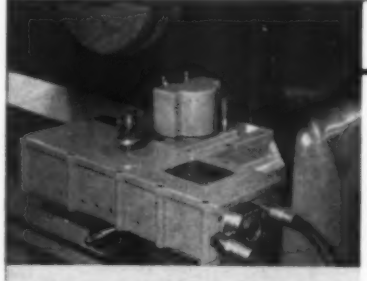


enables "tenth tolerance" grinding of turbine vane faces

Two turbine vanes are simultaneously profiled on double wheel grinder. Parts are rotated to grind other side.



One pass automatic dressing employs double diamond fixture. Diamond "A" dresses right wheel; "B" dresses left wheel. Both have uniform peripheral speed.



Precision calculated contour templates are interchangeable. 10:1 inclined plane reduction with ball slides assures repetitive accuracy and trouble-free dressing.

GRINDING PROFILES NEVER BEFORE POSSIBLE . . . are now produced by standard grinding procedures in the aircraft, automotive and business machine fields. Production grinding of parts such as these results from the application of Hoglund Contour Wheel Dressers.

Through automaticity and ingenious inclined planes contour reduction, Hoglund Dressers *initiate the accuracy* necessary to any contour grinding job. Hydraulically operated, tied into the grinding cycle, they feature quick-change contour templates for multiple use.

Hoglund Dressers have been applied to *every type of grinder.* The whole story on their advantages to production or short-run grinding is yours for the asking.

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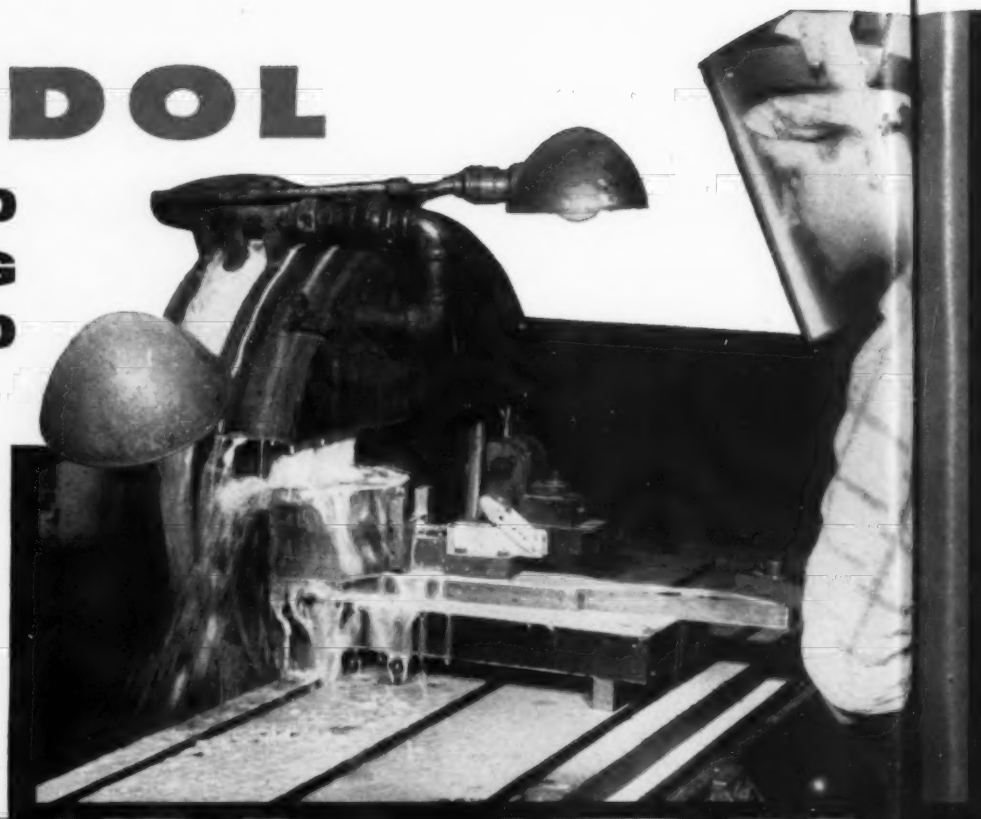

Disc grinder (right) hogs off approximately .035 in. from rough Alnico castings. Small segmented bar-type magnets are ground at a high rate of production on an automatic double-spindle disc grinder. Stuart's Codol helps maintain profitable production . . . covers machine ways and moving parts with a rust-inhibiting film of light petroleum oil.

Continuous grinding is more efficient with Codol as it resists overheating, minimizes wheel loading . . . reduces downtime for sharpening the wheel.

Codol's stability prolongs its effectiveness, reducing cutting oil costs. More than 15,000 gallons of a 3.5 per cent Codol and water solution are circulated from this outdoor reservoir to a battery of grinders in the Spaulding Works of Crucible Steel Company.

How you can use Stuart's CODOL to step up production and reduce costs!

Take advantage of today's improved wheel bonds and more powerful grinding machines by using Stuart's Codol Liquid Grinding Compound . . . a carefully formulated combination of petroleum oil and emulsifier. To give you maximum on-the-job economy, Codol permits faster stock removal, using heavier feeds and harder, larger wheels. For Codol *lubricates* as it cools, prevents metal flow and wheel loading, and eliminates stress failure from heat generated by grinding. On precision work, Codol guards against heat distortion and assures maximum dimensional control . . . especially important when grinding thin-walled parts. Break the heat barrier and upgrade performance on your cylindrical, centerless, and surface grinding operations with Stuart's Codol!

"Rust problems eliminated with Stuart Codol," that's the report from the Spaulding Works of Crucible Steel Company, Harrison, N. J.—makers of widely used Alnico magnets. Experience there on several different grinding machines has proved that Codol's high detergency, lubricity, cooling, and rust-inhibiting characteristics save money by reducing machine wear . . . prolonging wheel life . . . providing good stock removal conditions for rough- and finish-grinding operations.

Since these grinders are serviced from a central reservoir, a highly developed water-mix compound is important for over-all production efficiency at Crucible.

Codol's carefully balanced surface tension floats chips away from the wheel, work, and machine . . . provides a protective film of lubricating oil for machine ways, guide bars, and moving parts . . . gives two-way cooling action that assures efficient grinding at high production rates.

Crucible Steel Co. eliminates rust, reduces machine wear, grinding with Stuart's Codol!

Codol keeps wheel free-cutting on this high-production, single-pass grinding operation, with .0025 in. downfeed per revolution.

Template checks accuracy of convex poles after grinding ends of rough Alnico castings. Codol keeps wheels sharp and free-cutting when "hogging off" stock on the disc grinder.

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Arrange now to test Stuart's Codol on your difficult grinding jobs.

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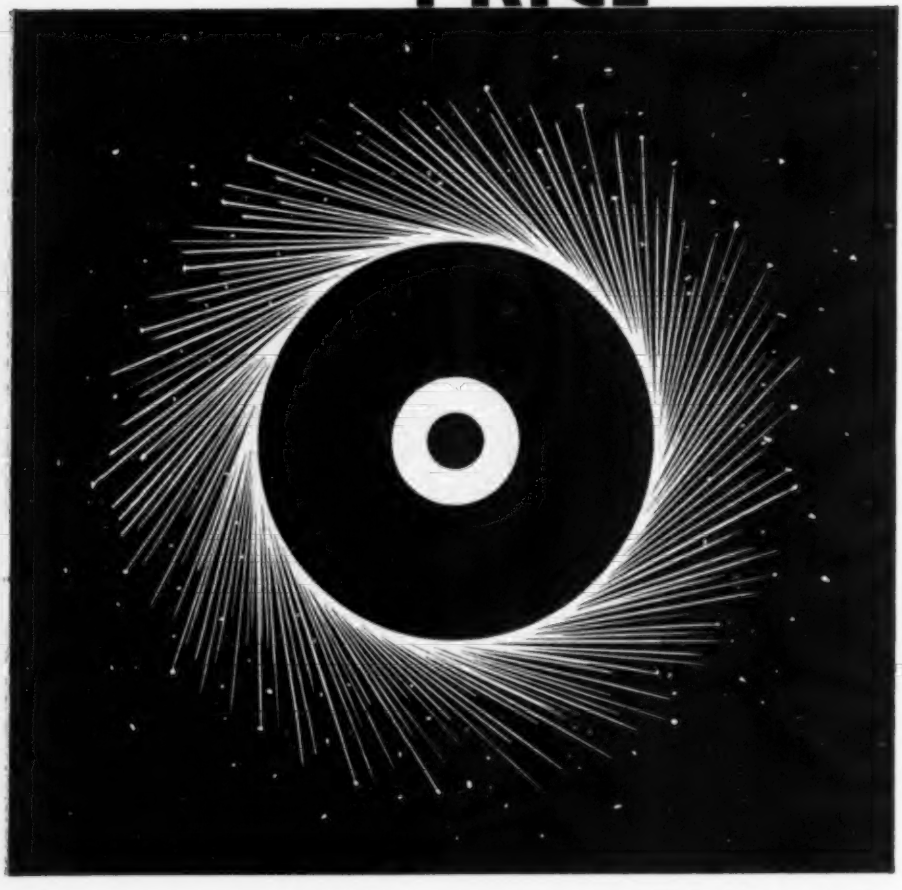

Recent tests prove Torit Dust Collectors can recover up to 37% of diamond chips

Due to the rapid increase in industrial diamond value, bort (recovered diamonds) has reached a record high price. It is becoming more and more important to recover diamond chips broken off during grinding and finishing operations. In recent on-the-job tests conducted at one of the nation's largest manufacturing plants, Torit Dust Collectors recovered 37% of bort from 100 mesh wheels. Average recovery from all sizes of wheels was 20%. The recovery of the bort alone soon paid for the Torit units.

Torit Collectors have a higher recovery rate than any other dust collector because of their stronger suction and *cloth filters*. This filtering cloth stops diamond particles better than any other filter known. Furthermore, the valuable material is caught on the *outside* of the filters—none of it is lost in the filter itself. Why not discover how much money Torit Dust Collectors can save you in diamond salvage, while giving you cleaner, more productive work areas.

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Industry Observer

Three developments in superalloys promise to make life a little harder for the men who are faced with grinding the tricky new materials.

● Titanium mill products producers reduced prices recently, following the lead of Titanium Metals Corp. This will make titanium available for more applications throughout industry. Government has also adjusted orders for the hard-to-grind metal downward as aircraft production is slacked off a bit.

● Allegheny Ludlum announced it was putting into service a new "consumable electrode vacuum remelting" furnace, which will speed development and production of superalloys such as titanium, zirconium and high alloy steels. As tougher metals come into service, the grinding problems come with them.

● Armour Research Foundation says small, hard particles a few millionths of an inch in diameter are being "dispersed" in alloys to form new high strength materials which will hold up at high temperatures. Particles act like gravel reinforcement in an asphalt road and strengthen materials that ordinarily would be like taffy at high temperatures. Such strengthening will also increase resistance to abrasion, they said.

States that use their imagination to meet the needs of modern industry will succeed in attracting new corporate payrolls, according to Donald H. Jensen, an official of Square D Company. Jensen outlined a program states could follow, including the following projects:

Establishment of industrial annexes to university campuses, to cope with complex research problems.

Industrial parks offset along

(Continued page 14)

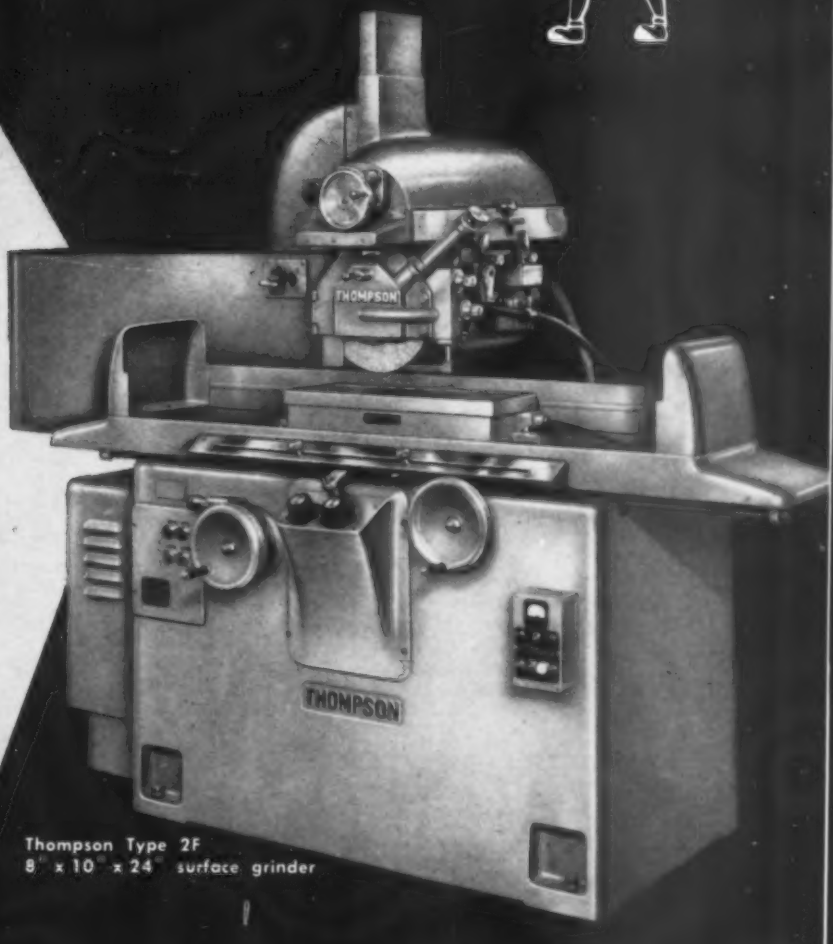
PRECISION PETE SAYS:

Only Thompson Type 2F Grinder has all three available . . .

1 COOLANT THRU THE WHEEL . .

2 . . . COOLANT EXTERNALLY ON THE WORK . . .

3 . . . AND "IN POSITION" WHEEL TRUING



Thompson Type 2F
8" x 10" x 24" surface grinder

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SPRINGFIELD, OHIO

Thompson SURFACE Grinders

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They made 1 wheel

Working closely with foreman Bill Todd (right) of Whitin Machine Works, Whitinsville, Mass., and with Bay State's sales engineering department, distributor Vic Ericson, of Johnson deVou, Worcester, Mass., has helped cut Whitin's grinding costs thousands of dollars a year.

do the work of 12

This is the story of two stubborn men and what seemed to be an impractical idea. The idea still seems pretty amazing to many experienced grinding men . . . but time and cost sheets over a four year period *prove* that it works.

Here's the story.

The central grinding department at Whitin Machine Works has all the problems of job-shop operation. Their centerless grinders, for example, are used to finish parts that range from 1 8" to a full 5" diameter and come in bronze, brass, aluminum, cast iron, Meehanite and all types of soft and hardened steel. Runs are short; as low as three or four pieces and rarely over a couple of hundred.

To handle this tremendous variety of jobs, the shop had stocked a dozen different types of grinding wheels and foreman Bill Todd wanted to simplify. He wanted to cut the amount of valuable labor and machine time that went into wheel changes and put it into production. And, what he really hoped to get was not just a few multi-purpose wheels but *one all-purpose* wheel.

Successful in convincing Whitin's tool control engineer that it was worth the try, he called in Bay State distributor Vic Ericson. Ericson accepted the challenge and went to work with Bay State's sales engineering department. The effort paid off.

The result was a single wheel that handles all the sizes and all the metals. On regular work, finishes average around #16RMS and Bill Todd's skilled operators can get as fine as #2; a single dressing once an hour maintains normal high production rates.

Whatever your company's abrasive problems may be, you'll find Bay State representatives ready to help and competent to work out practical solutions.

BAY STATE ABRASIVES

BAY STATE
WHEELS of PROGRESS

Bay State Abrasive Products Co., Westboro, Massachusetts.
Branch Offices and Warehouses: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh.
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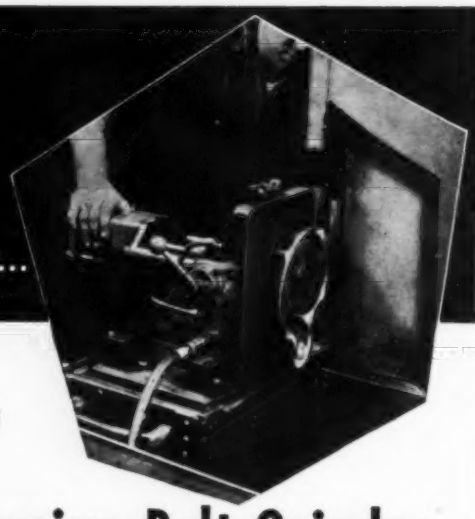
When shape and inaccessibility makes flat-surface machining of pump housings difficult...



Graymills Corp. cuts costs dramatically with an

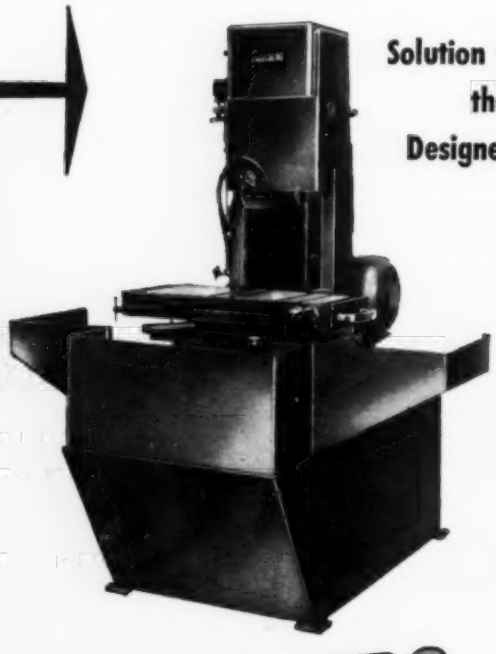
Engelberg Abrasive Belt Grinder

The shape of the intake-discharge housing on a Graymills immersion pump makes it unsuitable for surface milling or turning on a lathe. When either method is used, pump leakage results in as much as 10% of production runs, requiring corrective machining that pushes unit costs up.

Graymills installed an Engelberg platen type abrasive belt grinder, equipped with an automatic infeed table. To this machine (the BG8-FT9 described below) Graymills attached a draw-bar air fixture developed by their own engineers, designed to handle several sizes of castings with short run flexibility and minimum setup time.

Grinding rates on the grey metal pump castings are now considerably faster than alternative methods, in spite of a 1/32" stock removal. Very satisfactory belt life is obtained with 24-grit silicon carbide running at 5,000 s.f/m., cooled by a water-soluble chemical.

In the Graymills experience, Engelberg abrasive belt grinders again prove their adaptability to specific needs . . . adaptability that is limited only by the ingenuity of the engineers who program its use.



Solution to Graymills' Problem:
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Designed for Mass Production

● Fast machining by wet or dry abrasive belt, backed by ground steel platen. Presetting controls rate of feed and pressure. Quick approach of ball-bearing table is followed by slower, hydraulically controlled infeed down to Micro-Stop limit. Does fine tool room jobs of surfacing, squaring, grinding angles, bevels, radii, etc.

For complete information on this and other Engelberg Abrasive Belt Grinders, write . . .

The ENGELBERG HULLER Co., Inc.
327 Seneca St., Syracuse, N. Y.

ENGELBERG
Precision ABRASIVE BELT GRINDERS

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Observer . . .

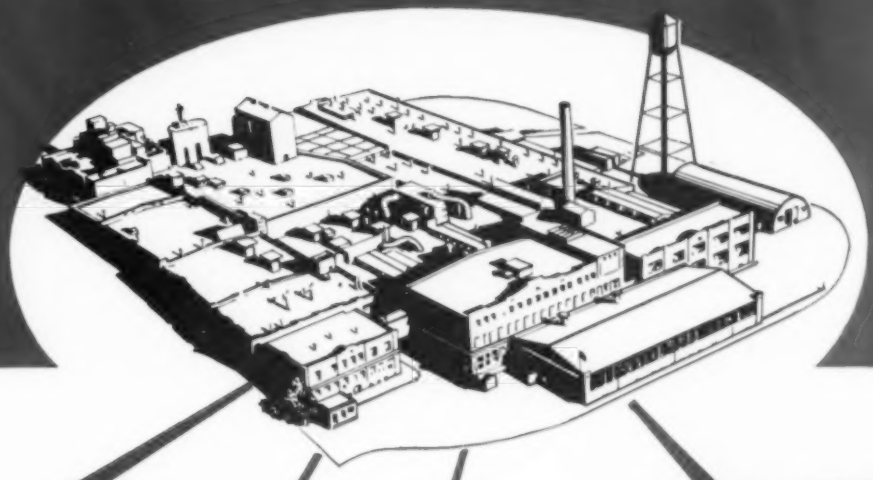
state turnpike systems, to enable employees to drive to work safely, and to speed delivery of freight and raw materials.
Industrial service hubs to help metropolitan centers hold and attract industry, rising on land cleared of "factory slums."

Few technical advances apparently were brought to light in recent meetings of the Industrial Diamond Association in Detroit. Little progress has been made on standardization of diamond tools, which has been in the works for quite a while. Stockpiling was discussed by the BDSA representatives from the Commerce Department who were present. The IDA hasn't taken official recognition of the recent progress in production of synthetic diamonds and borazon, although members clearly see the potential use of the GE materials in industrial applications.

Three General Motors engineers who scanned the automotive gas turbine's future at the Society of Automotive Engineers' annual meeting pictured gas turbines as "practical and feasible" now for heavy duty and military vehicles, with "no additional engineering breakthroughs required to put heavy turbine vehicles on the road." More work is needed in manufacturing, though. Coming of the new superhighways will be a distinct advantage to the use of turbine trucks.

Literature we've recently received from West German abrasive wheel manufacturers shows they're not exactly conservative about speed recommendations for operating their products. Cutoff wheels, for example, can be operated at 19,700 surface feet, against the recommended maximum speed of 16,000 surface feet in the newly adopted ASA Grinding Wheel Safety Code. The same is true for reinforced depressed center discs.

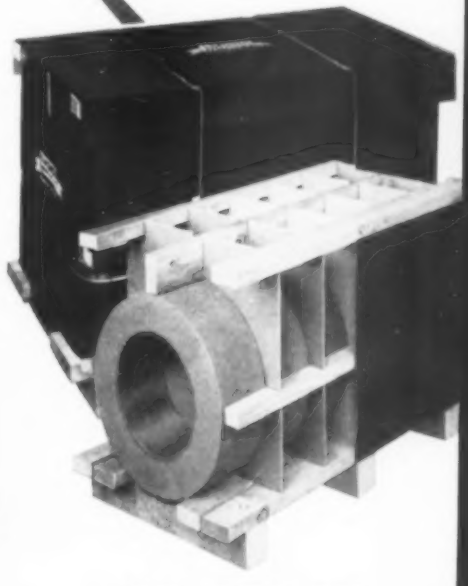
Now Simonds Grinding Wheels SHIPPED ON PALLETS for *Greater Savings*



SIER ACCESS

SPACE SAVING

EASY HANDLING



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Specially engineered to save your stockroom space and reduce handling! That's the cost-saving idea of these new packages for Simonds Grinding Wheels.
No crates to pry open. No sawdust to unpack! The grinding wheels are racked or stacked on pallets . . .
held secure by steel straps . . . and protected by corrugated wrappers and dividers. Easily handled by fork-lift or hand-pallet truck. Another reason why it pays to specify Simonds Grinding Wheels.

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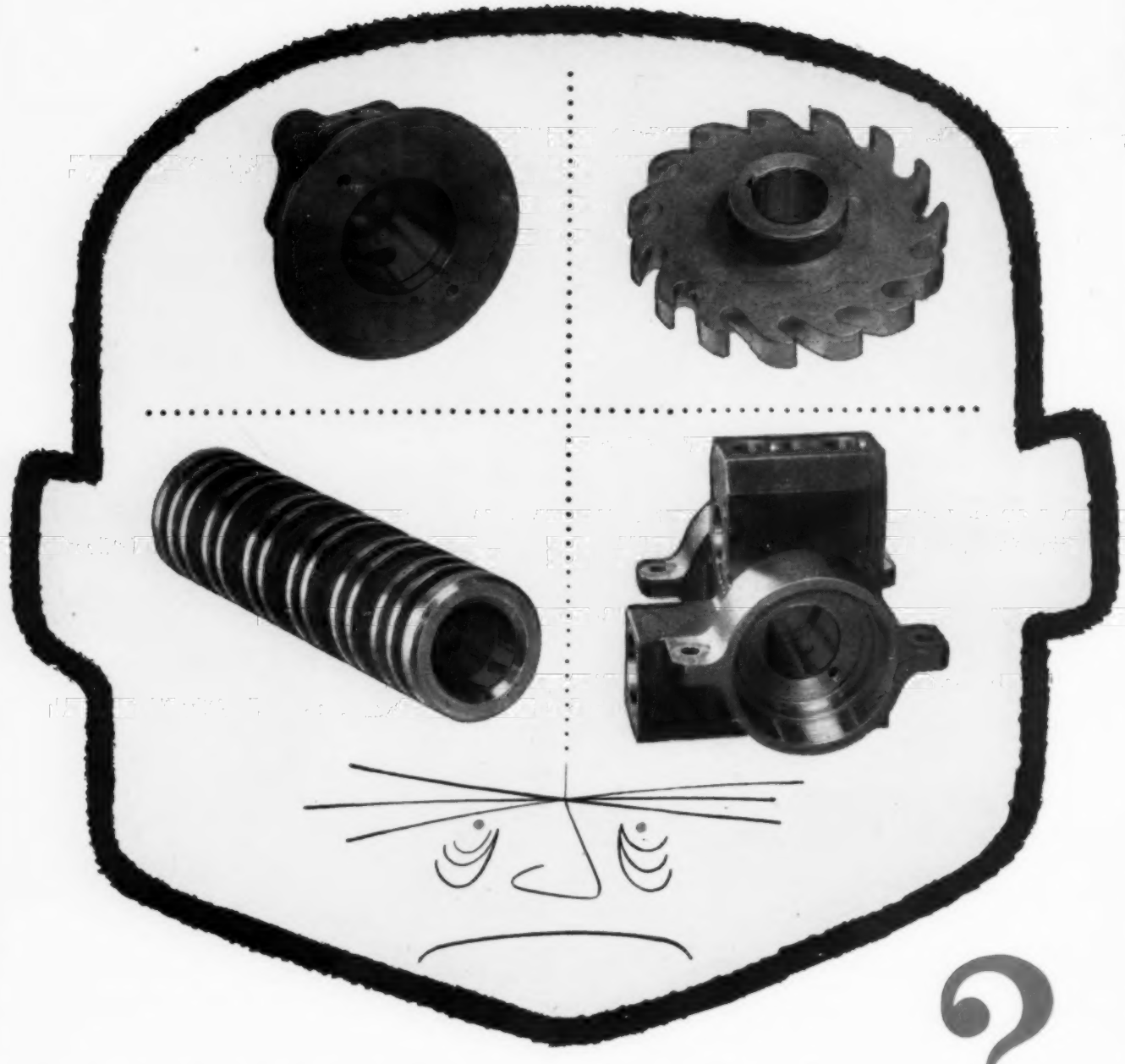

are holes giving you headaches

Why not ease the pressure? Add a Sunnen Honing Machine to your shop now.

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It will size, finish, de-burr and correct hole distortion . . . in practically any material, soft or hardened. You will find that it's the most profitable investment for your shop.

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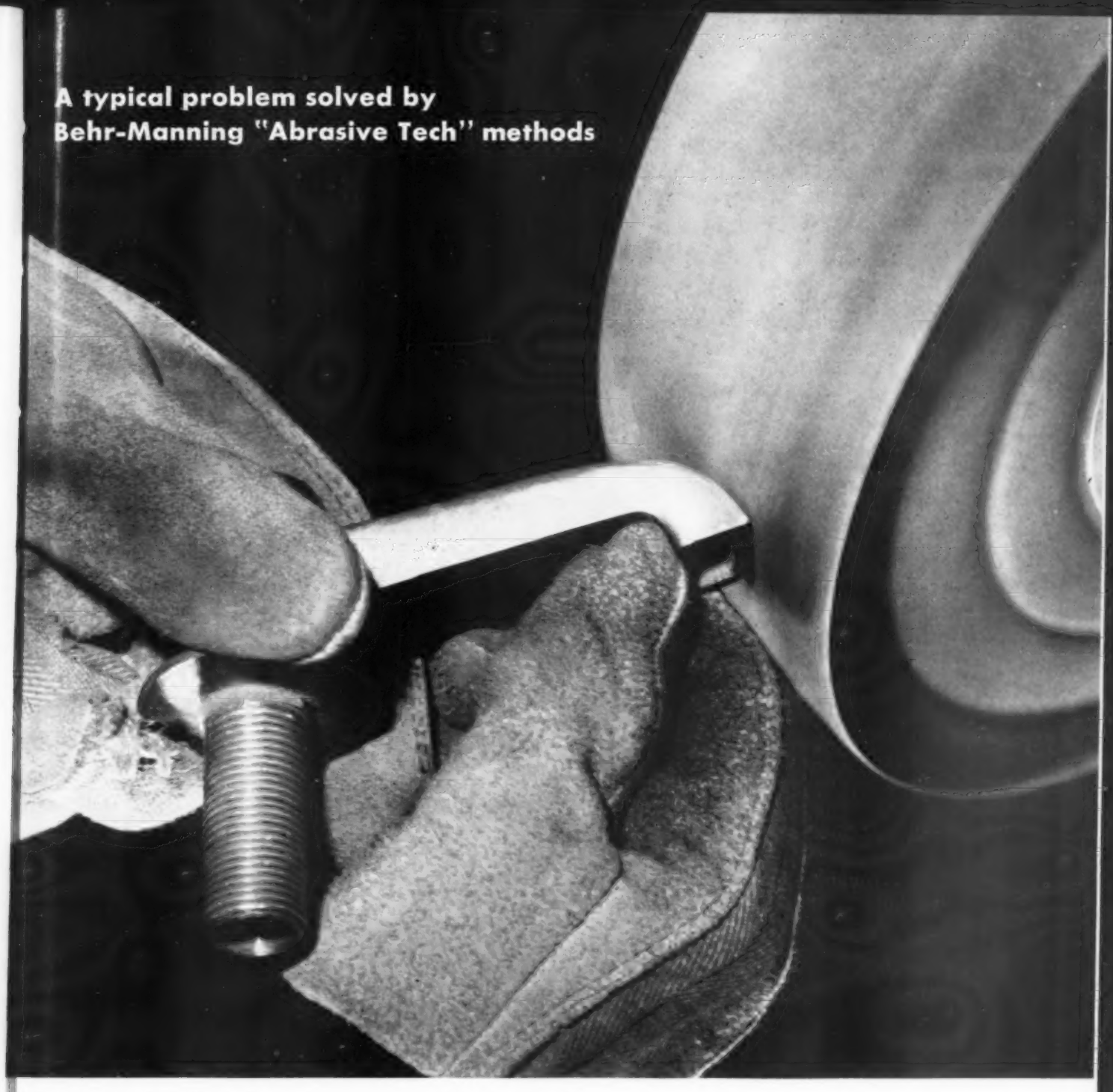

8 steps in finishing were eliminated by using abrasive belts to rough and polish cast-brass faucets prior to plating. Polishing, for example, was faster and smoother with a 3-in. x 90-in. Lightning Metalite Cloth belt, grit 240, running at 9000 sfpm over a 14-in. stitched buff contact roll on a Crown Rheostat Polishing Lathe. The belt is lubricated with a light grease stick. Time, labor, and material costs have all been cut by this "Abrasive Tech" method. Perhaps Behr-Manning technical service may provide similar benefits for your production.

Very often a Behr-Manning methods engineer can provide a helping hand with different finishing problems. Just call the nearest Behr-Manning office for a date. There are 17 well-equipped "Abrasive Tech" Methods Rooms, available for problem-solving, or helping finishers brush up on new techniques: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, Teterboro, Camden, San Francisco, Seattle, St. Louis, and Brantford, Canada. Main office and plant: Troy, N. Y. For Export: Norton Behr-Manning Overseas, Inc., Troy, N. Y., U.S.A.

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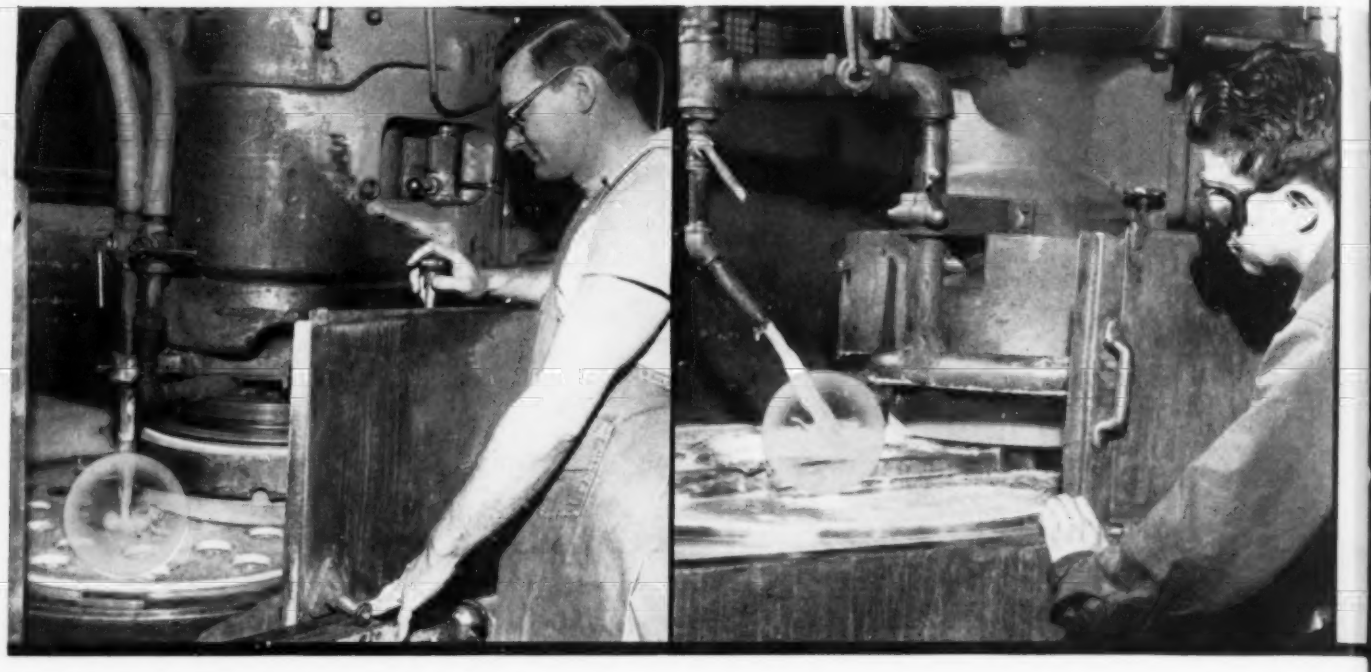

When you surface grind with segments

Take advantage of this COMPLETE Line

. . . and add the profit-boosting "Touch of Gold" to any surface grinder

You can be sure that switching from grinding wheels to Norton abrasive segments brings powerful, profit-building "Touch of Gold" benefits to very many jobs.

Because —

Norton makes segments in every required shape and size and in exactly the right abrasive and bond for best results in the widest variety of surface grinding — on ferrous and non-ferrous metals and on work pieces ranging from boiler plate to the hardest die steels, die sets or blocks.

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Ask Your Norton Distributor for the booklet, "The A.B.C. of Surface Grinding." Or write to NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

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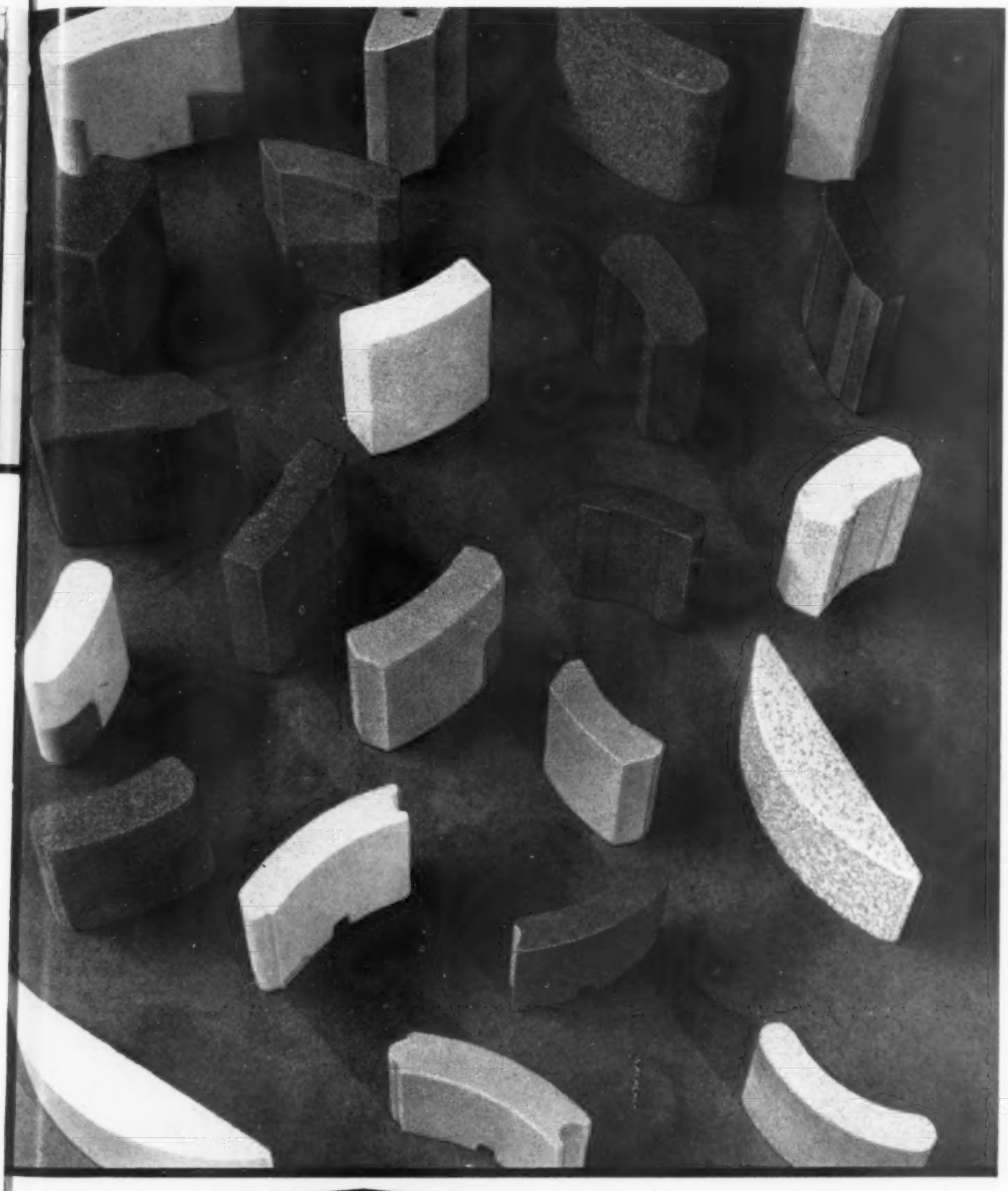
*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries



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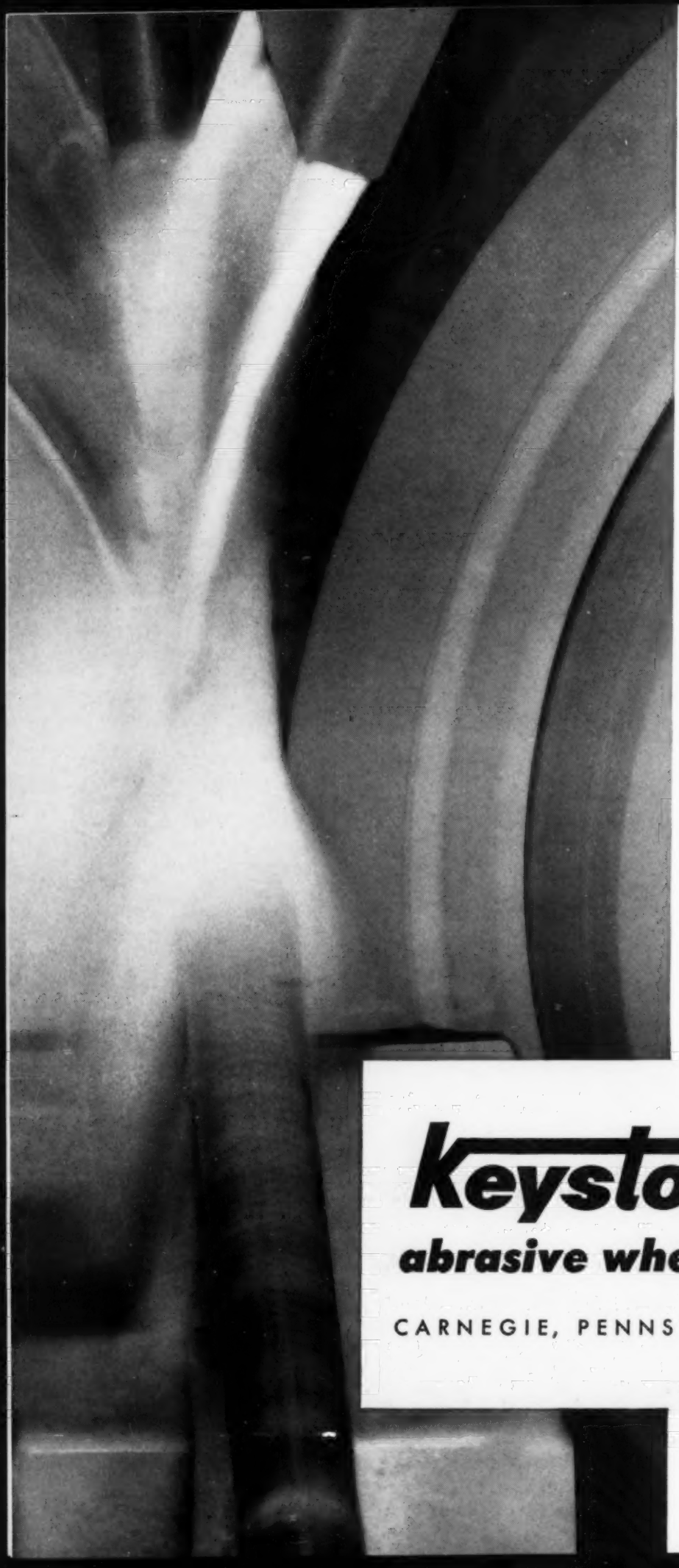

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A-L demands top performance from their grinding wheels—the kind of performance that keeps production high and costs down. Keystone wheels are giving A-L this type of performance day after day in finishing and snagging operations. Keystone can supply your every grinding need, too. Our reputation is built upon quality and service.

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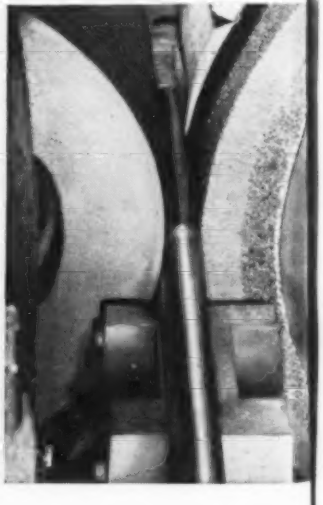
Grinding operation stopped for purposes of illustration



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abrasive wheel co.

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Three 6-18 Models . . . for Toolroom and Production Grinding

REID . . . the quality name in surface grinders . . . now has three different models in the 6" — 18" size. If your production schedule demands maximum automation, there's a REID 618P with power table and power cross feed. A REID 618PT with power table and hand cross feed is also available.

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Worktable: 51" x 8" overall; 6" x 18" working surface
Table Speed: Infinitely variable from 12 to 35 FPM
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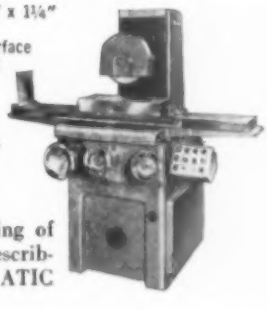
Weight: 2400 lbs.
Electrical: 3 phase, 60 cycle, 220, 440 or 550 volts
All Models Equipped with Automatic Lubrication as Standard Equipment



For Toolroom and Production Grinding of larger capacity, write for bulletin 824 describing our New All Electric 8-24 REID-O-MATIC Surface Grinder.

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MANUFACTURERS OF PRECISION SURFACE GRINDERS AND PRODUCTION LATHES

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Just *any* gage is not good enough. Some dimensions require a higher degree of accuracy than others. And some dimensions cannot be reached directly. Still others need ranges or adjustments to give greater gage capacity.

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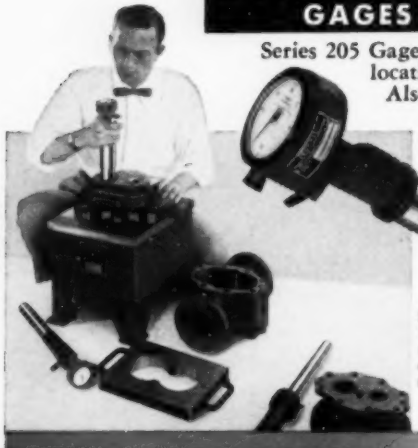
Series 205 Gages accurately check hole location and concentricity. Also adaptable to applications involving hole and surface relationships.

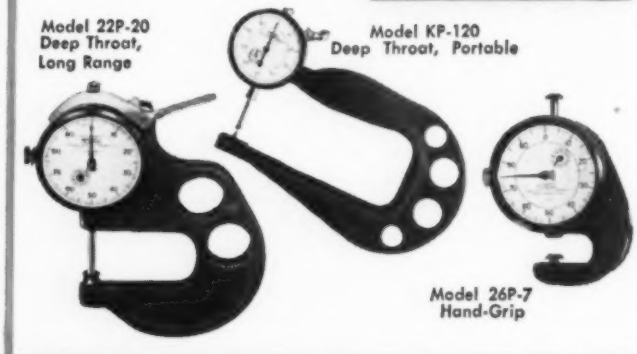


Typical Series 205 Gage (12 Basic Models)

Squareness and location of holes in three mating parts of pump are checked to determine alignment within .0001".

ALL TYPES OF THICKNESS GAGES

Many styles and sizes, for portable and bench use.



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Grinding and Finishing

Editor's Page

Depreciation Policy and the Production Man

This is an age of "galloping obsolescence", as it was so well put by Jerome Raterman, president of the Machine Tool Builders Association. An age when technological advances have come at a dizzying pace—where obsolescence has far outstripped physical wear and tear in reducing a machine's productivity. These advances have probably alerted production management as never before to the opportunities for cost reduction and increased production through an enlightened program of machine replacement.

Yet there is another factor in machine replacement, aside from the basic recognition that your competitor will walk away with the business if you aren't alert to improvements in machines and processes. That other factor is depreciation policy. You had better spend some time examining the economic forces that make possible, in the final analysis, the replacement of your machines and equipment. If you are the operating manager of a plant, this may be the key to success of the enterprise. If you are a production man, you ought to be fully informed, too.

The government has cut back the so-called fast amortization program, or "fast writeoff" procedure for capital equipment that had been set up as a result of the Korean emergency. This fiscal policy had made possible much of the replacement of outmoded equipment that has been taking place in the last few years. And it was undoubtedly at least partly responsible for some of the technological progress we've seen.

Now industry must examine its depreciation policies as never before, to make sure that inflation—which extracts the same painful and heavy toll as death and taxes—doesn't do us under. Many companies are suffering the delusion that the smaller the depreciation allowance, the greater the profit. Joel Barlow, legal counsel for the NMTBA, has stated that nearly one-third of American industrial concerns are still bound to the old straight-line method of depreciation. He says the plain fact is that those people have been losing out to both their competitors and inflation, because they haven't been "getting their investment behind them" fast enough.

The two popular methods of depreciation which have been developed for today's industry are the "double-declining-balance" and the "sum-of-the-digits" methods. Either of these methods have distinct advantages taxwise over the straight-line method as faster methods of depreciation. You ought to investigate their use.

In the meantime, the Government appears to be groping about for a satisfactory method of tax depreciation to put into effect, now that fast write-offs are at an end. At the time this issue goes to press, it isn't clear what the nature of the new policy will be. One of the proposed procedures is a "bracket-ceiling" method, which might put a bracket ceiling of seven to ten years on the depreciable life of durable productive machinery and equipment. This proposed life seems reasonable in view of the growing obsolescence factor. It is certainly better than a return to the old Schedule F with its 20 to 25 year depreciation period, which would assuredly stifle present-day business. Plants just wouldn't be able to buy and replace equipment if they have to use the dollars of 20 to 25 years from now.

One cardinal point we'll have to keep in mind—we'd better not get too fond of that shiny new machine, for our own economic well-being, because "galloping obsolescence" is a reality.

Jack Kenyon
Managing Editor

Make every cent of your GRINDING WHEEL DOLLAR COUNT

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Whatever the grinding job . . . tool sharpening, surface grinding, cylindrical grinding, or metal cut off, you'll find a Macklin tool room wheel of the right type, the right size, the right abrasive and bond.

The reason? Macklin's abrasive experience and modern-as-tomorrow productive capacity. Each wheel is expertly engineered and precisely manufactured to assure you top results, wheel after wheel, job after job.

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V8

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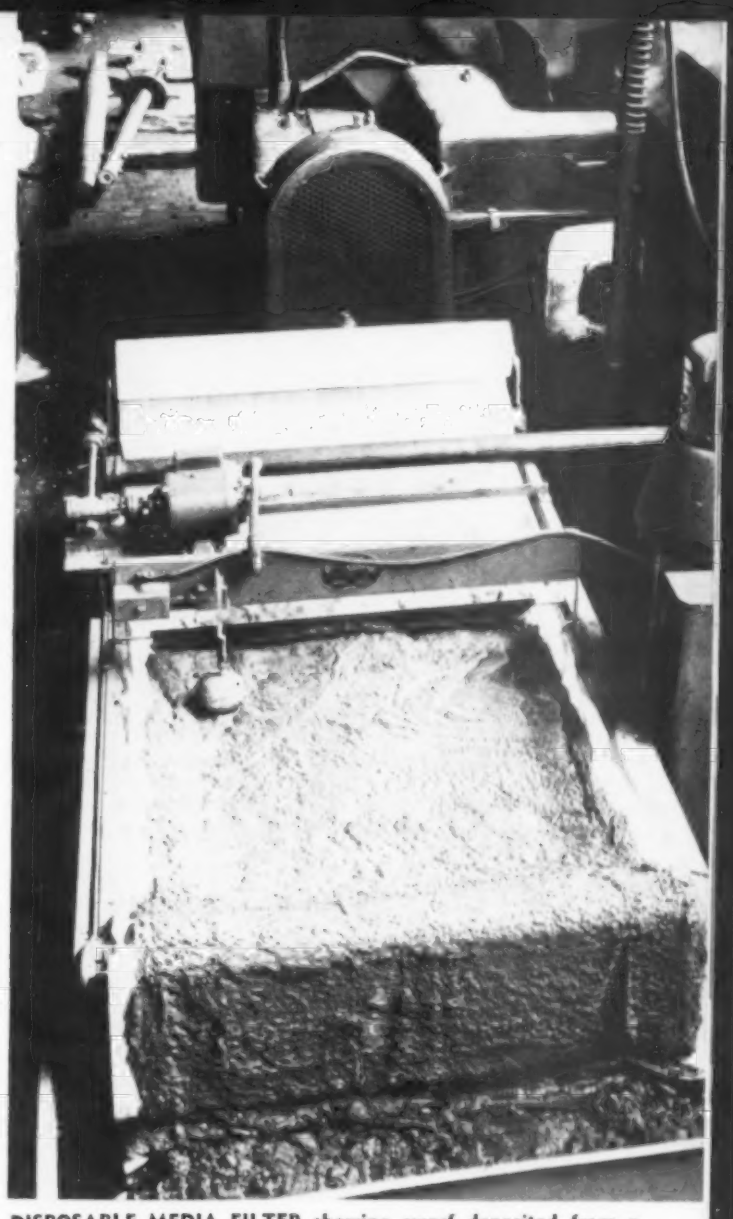
grinding — finishing
JULY 1957

8 WAYS to Clean Grinding Coolants



DISPOSABLE MEDIA FILTER showing swarf deposited from a Norton roll grinder.

by **A. S. Harlan**
Vice President and Chief Engineer
Industrial Filtration Company

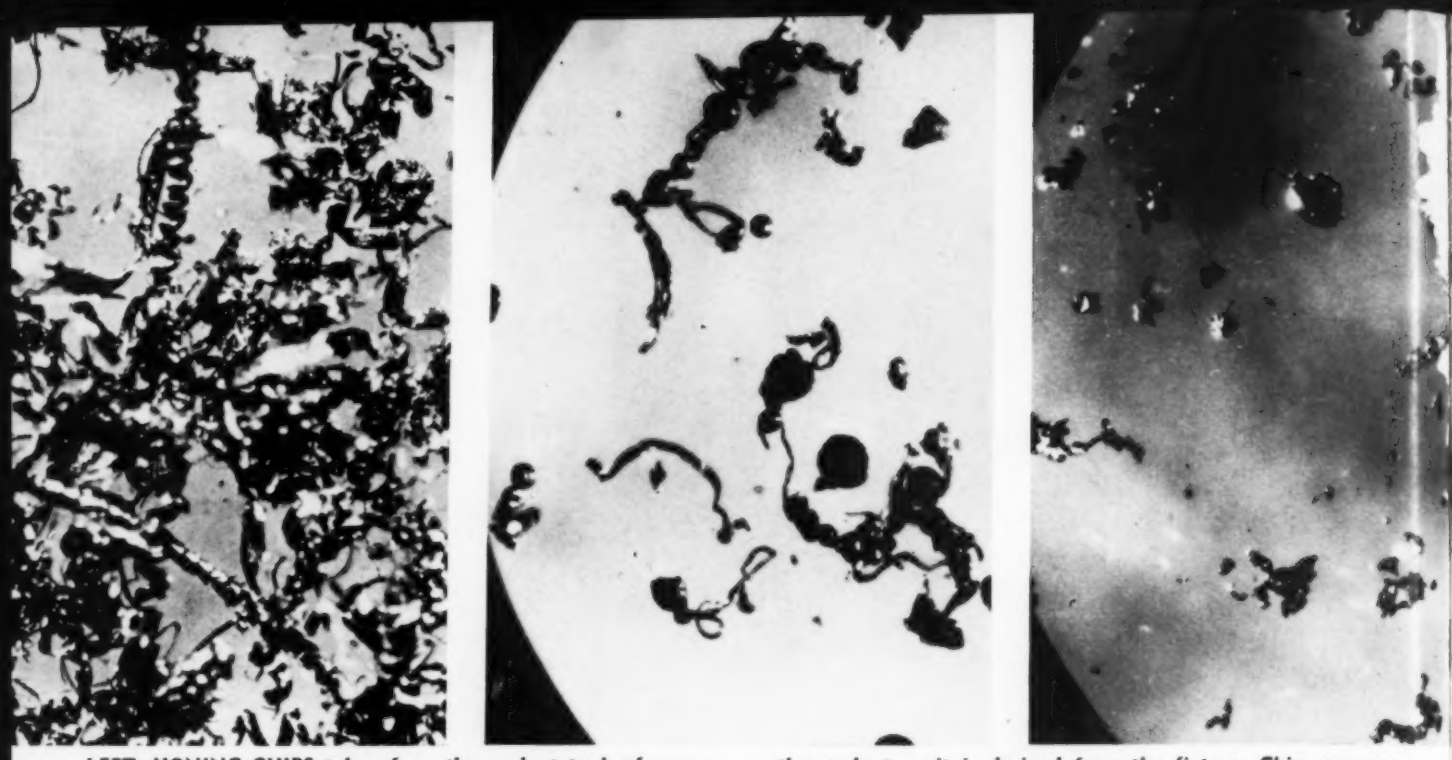
● Keeping machine tool coolants clean is being recognized as a basic necessity in maintaining efficiency of abrasive metalworking operations. This article summarizes the major techniques of cleaning and filtration which are available.

The normal breakdown of the abrasive tools used in grinding and honing releases large quantities of minute abrasive particles into the machine coolant. Without filtration, these particles of abrasive and the metal grindings are carried into the reservoir of the machines where, in the course of operation, they eventually displace the coolant. This, in itself, results in the necessity of shutting down the operation of the machine for cleaning of the reservoir. The resultant loss of productive capacity, the idle time of the operator and the maintenance labor time are reflected in large losses of money.

Other factors, less obvious, contribute to even greater losses. The coolant, compounded for lubrication of the grinding abrasive and for the removal of heat from the work becomes less effective due to the heat retention properties of the small abrasive and metal particles held in the machine reservoir. Thus, the coolant operating at a much higher temperature, instead of keeping the work at a nominal heat, adds to the heat of the work and causes expansion of the part being machined. As a result, the tolerances of accuracy are difficult, if not impossible, to maintain due to the shrinkage and change in size when the work is removed from the machine and cooled. The obvious result is rejects.

The recirculated coolant in its passage through the reservoir often does not lose the fine bits of abrasive and metal. These are recirculated through the pump causing wear on the numerous glands, pump parts and on the machine ultimately wearing out these parts ahead of their material life. Maintenance and replacement parts add even greater to the operational overhead.

With the recirculation of abrasive and metal particles in the unfiltered coolant, the effect on the abrasive wheel or block is of a deteriorating nature. These free, suspended particles are carried in the coolant to the wheel and work. The metal particles becom-



LEFT, HONING CHIPS taken from the coolant tank of a machine honing steel tubing. Some of these chips are 18 inches long. Center, grinding chips picked up by a magnet held near a grinding wheel. Right, honing chips collected by a magnet in the coolant as it is drained from the fixture. Chips are very small having been broken into small bits as they pass between the abrasive grains in the stick. Photos courtesy Micromatic Hone.

8 Ways to Clean Grinding Coolants . . .

ing embedded in the porous structure of the abrasive. The free cutting action of the minute abrasive edges are impaired and the metal removed from the work is by attrition or sheer rubbing of metal against metal. Scores and scratches on finely ground work result in rejections.

The cutting efficiency of the abrasive wheel or block thus impaired must be restored to normal in order to retain accuracy. The abrasive must be dressed often and the life of it is drastically shortened and replacement cost increased.

The use of diamond wheels in working extremely hard metals has made filtration imperative in the preservation of the work quality and in the salvage of diamond dust or borte worn from the wheel. This material, easily salvaged through filtration has further use and is of high commercial value.

The coolant life, while generally considered expendable, can be materially lengthened through proper filtration. Bacteria, the cause of most coolant spoilage, thrives readily in the heat bearing solids of abrasive and metal in the machine reservoir. Under such ideal conditions conducive to rapid bacteria growth, the coolant life is drastically reduced. Cleaning the reservoirs of the contaminated abrasive, metal and coolant is one of the danger hazards in its exposure to industrial dermatitis. Such infection is one of the worst to overcome and has in some cases resulted in permanent injury and disability. Compensation benefits make filtration the feasible method to eliminate such occupational hazards.

Through proper filtration methods the spoilage of coolants is eliminated. Numerous case histories show that coolant replacement has been extended from a week to several months. The only attention necessary in such cases has been to add coolant to compensate for evaporation and to add rust inhibitors and anti-foam agents as required.

Types of Filters and Media Vary with the Application

Filters differ widely in the types, designs used and in performance. More commonly used in metalworking for the filtration of coolants are cartridge filters, centrifugal separators, magnetic separators, paper filters, cloth filters, settling tanks, pressure filters and vacuum-type filters. There are, in instances, combinations of two of the above mentioned types within a single separating and filtering unit.

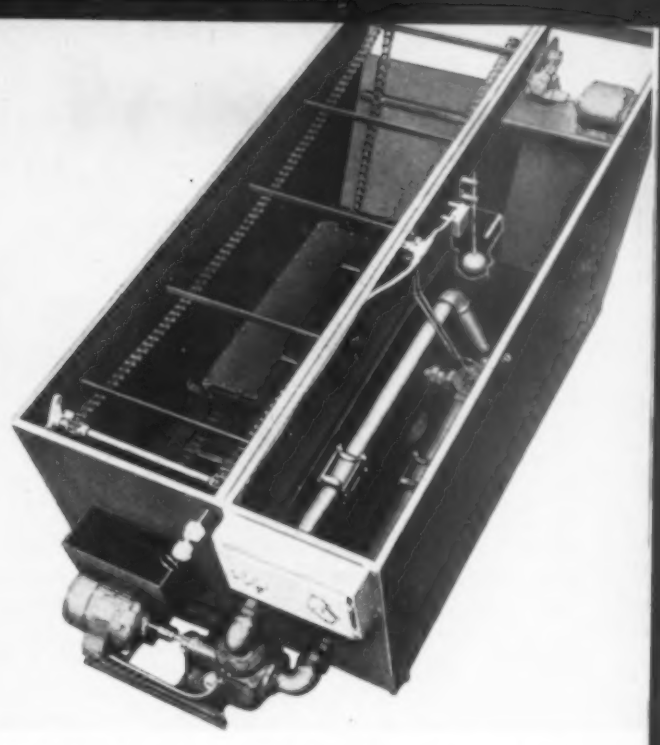
One of the determining factors in the selection of a filter is whether the unit is automatic in its self-cleaning operation or whether a temporary shut-down of the filtering unit is required in order to replace new filtering media as in the case of cartridge-type units. The maintenance labor costs involved and other factors have led to the popularity of the continuous, full flow, self-cleaning fully automatic filter which requires little or no attention.

Cartridge-Type Filters

These filters use an interchangeable filter core similar in nature to, but larger than, the more common automobile filter cartridge differing in that generally the outer shell or container may vary from the metal can type. The filter core is either industrial cleaning waste, cotton fiber paper wound in a roll, Fullers Earth blown or fluffed to prevent packing or diatomaceous earth.

While there are advantages to this type of filtration of coolants, particularly on small flow rates or on individual machines, there are certain marked disadvantages. Foremost is the cartridge cost un-

500x PHOTOMICROGRAPH of diatomaceous earth showing Diatom Silaceous skeleton structures which form highly efficient filter precoat on pressure and vacuum filter tubular screen elements. Photo courtesy Johns-Manville.



LOOKING DOWN into Filter-Matic filter showing filtering area on left and clean coolant reservoir on the right. Unit is shown with cover removed.

der a limited life and the maintenance labor and down-time of the unit during replacement. While in most cases, a clean or filtered oil reservoir prevents the shut-down of the machine being served, contamination of the clean storage reservoir is possible through complete failure of the cartridge.

Cartridge failure is usually caused by heavy deposits which block off the normal filtering process. The pressures under which the fluid flows through the filter causes "channeling" or tubes to be formed through the filter cartridge which allows the fluids to pass through the cartridge with little or no filtering action whatever. As a result, the clean or filtered liquid reservoir becomes contaminated and the previous filtering action is negativated by the unfiltered solids carried through the "channels" in the cartridge.

While, in their efficient state, some cartridge filters remove not only suspended solids but also oil soluble oxidation elements acid and resins, they may also remove additives which help retain desirable qualities necessary to the efficiency of the oil.

Centrifugal Separators

The centrifuging of liquids is one of the oldest methods of separating materials by mechanical means in relation to their varying specific gravities. Heavier contaminants are thrown out of liquids by centrifugal force and collected in an outer retainer of the separator where they are discharged from the machine.

Centrifuging will separate some types of emulsion as well as remove all suspended solids, water, swarf and soap. It may be used on intermittent separation cycles or continuously.

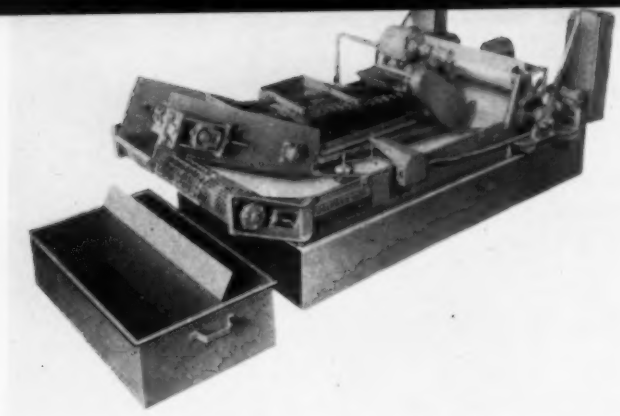
Magnetic Separators

The use of magnetic equipment for the removal of ferrous grindings and chips from coolants has become increasingly used. The conventional magnetic separators make use of a sealed rotating cylindrical drum which houses Alnico Magnets placed against the inner periphery side of the drum. The liquid is fed into the separator under the lower part of the drum, and the magnets draw the magnetizable particles to the outer surface of the drum opposite the magnets. As the drum slowly rotates and carries the particles above the liquid level, a rubber roller idling on the drum presses out the retained liquid. A fixed scraper blade on a trough removes the held particles on the downward cycle of the drum.

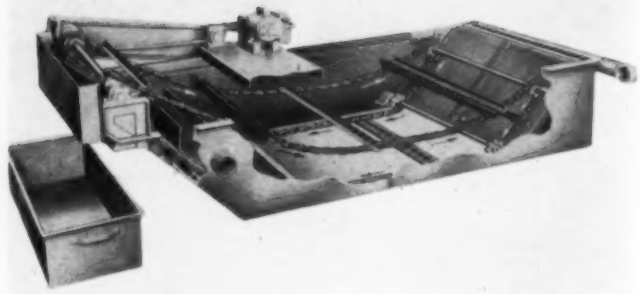
It must be remembered that magnetic separation is contingent upon ferrous solids being held in suspension in the coolant. Only particles with physical properties which respond to magnetism can be removed. It is, therefore, obvious that bits of abrasive and other foreign particles would remain within the coolant. Thus, on grinding operations, magnetic separation is not 100% efficient.

Recent developments in patents design have altered the magnetic separator principle. This new unit incorporates a flat trough or tray of shallow design. This tray, constructed of aluminum to prevent permanent magnetization, has an enormous concentration of Alnico No. 5 Magnets fixed horizontally under the aluminum bottom. The contaminated liquid pours onto the surface in a continuous flow through a diffuser. The liquid level is held to a nominal depth which brings the liquid surface within the influence of the magnetic field. As a result, all liquid is exposed to the magnetic field and the subsequent force removes the ferrous particles. The liquid flows over the edges of the trough into a tank for storage or a paper filter for removal of abrasives.

The ferrous sludge held by the magnets is removed by chain driven aluminum flights which carry it up a ramp and deposit it



COMBINATION MAGNETIC separator and disposable media filter which gives near-perfect filtration. The magnetic separator removes all ferrous particles and the disposable media filter removes all wheel and unmagnetizable particles.



TYPICAL SETTLING TANK showing settling basin and bar stock screens at right end of filter. Chain driven flights remove sediment from the bar stock screen and the bottom of the filtering area and deposit it into disposal box.

in a disposal box. An advantage of this new type magnetic separation is represented in the flowing of the liquid on top of the magnetic field which utilizes gravitation as well as magnetization. The magnets do not have to overcome gravity in pulling the ferrous particles down to the aluminum plate. Also, the flat magnetic field and its large area permit the liquid to be fed onto the separator with a low velocity flow thus reducing turbulence to a minimum. These new design magnetic separators use more magnets and produce a magnetic field of much greater power than the conventional rotating drum-type units.

Complete filtration with magnetic separators is accomplished by combining the unit with an automatic paper-type filter to insure the removal of non-ferrous contaminants.

Paper Filters

The use of paper for filtration is a relatively common practice, but until the past few years was confined more or less to cartridge-type and mechanical edge-type filters. The merits of cartridge-type filters has been previously discussed. The mechanical edge-type which uses stacks of paper disks have low sludge holding capacity although some are equipped with self-cleaning features which overcome, to an extent, this limitation.

The most recent development in paper filtration has been in the use of the roll fed paper belt filter. This unit filters solids from liquids that will flow, by gravity, through filter material and discharge the solids in a relatively dry state, into an outside container.

The filter material, fed from a roll, rests on, and conforms to a flat endless conveyor of open construction. Sloping sides form a shallow pool of the conveyor and an inclined discharge ramp provides for removal of filtered solids.

Dirt-laden liquid is fed onto the filter material, the liquids pass through and the solids remain on the surface of the filter material. When the flow through the filter material is reduced by the solids held upon it, the liquid level rises. This action, raises a float which actuates a switch, causing the conveyor to carry the filter material forward to discharge the accumulated solids and bring clean filtering material under the incoming dirty liquid. The float drops as the level of the liquid lowers, the conveyor stops until the need for clean filtering material again causes the liquid level to rise and the cycle is repeated.

This type filter, because of its automatic principles, virtually eliminates any attention other than the removal of discharged paper and swarf from the disposal box. The paper roll from which the paper is fed is replaced within a matter of seconds.

Through the development of this filter, central systems for the filtration of coolants and cutting oils have become even more practical.

It may be said in passing that this filter is highly versatile in its applications. There are numerous types of filter media which can be used on this unit. Thus, the filter media can be altered to a specific condition or requirement. Due to the special design and principle, this filter is used for the filtration of paint spray booth wash water to remove de-activated paint from the system and it is also used for the filtration of Quenching Oils. Both of these applications will be discussed later in this article.

Cloth-Type Filters

This type media usually used on small capacity machines or on portable filters used in periodic filtering of batches. In most cases, the fluid passes through a cloth bag or straining device which at intervals must be cleaned or replaced.

Settling Tank Filters

Settling tanks are usually relatively large rectangular tanks into which contaminated liquids are fed from the machine or system. The input is accomplished in such a way that a minimum of turbulence or agitation is created. Gravity action draws the heavier solids to the bottom of the tank where chain driven flights remove the sedimentation by dragging it up a ramp and depositing it into a tote box. The liquid flows through an interchangeable metal bar stock screen at one end of the tank and unsettled particles are deposited on it. The screen is automatically cleaned by brushes affixed to the chain driven flights.

This method is used when the removal of larger particles is desired. The bar screens filter to .004" and it is possible to achieve satisfactory filtration to this particle size. Primary objection to this system is the area required for the unit. Considerable floor area is required and, while the system is automatic, hand cleaning of the screens by removal is occasionally required to clean embedded particles from it.

Pressure-Type Filters

As the name implies, dirty fluids are piped into the filter under pressure and passed through a flat

metal screen or through tubular screens. With this type filtration, it is possible to use a filter aid (diatomaceous earth) if necessary as a screen precoating medium for absolute filtration. However, filtration without precoat assures the removal of particles to .003 size. There are several variations of this type of filter used in the metalworking industry.

A typical unit of this type makes use of tubular bronze screens manifolded into a header box. As sludge deposits form on the screens and the flow is impaired to the point of inefficiency, a backwash cycle manually operated, shuts off the inflowing dirty liquid and clean liquid is blown back through the tubular screens under pressure.

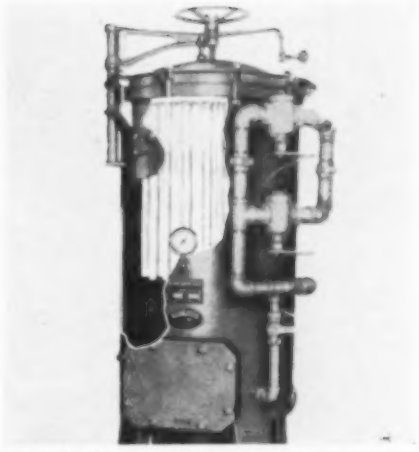
The deposits on the screens are forced off and drop to the bottom of the filter receptacle where an agitator reduces the caked sludge into a fluid mass. It is then discharged into a settling tank for further separation. The cycle is then again manually reversed for continuation of the filtering cycle.

Pressure-type filters have definite advantages in their ability to filter oils and fluids of a heavy viscosity or fluids heavily loaded with contaminants which tend to retard the fluidity. An example would be in the filtration of wire drawing oils which are of heavy consistency.

Precoat Filter Aid

Diatomaceous earth or diatomite is in reality the shell or outer skeleton of a single cell form of microscopic marine plant life. The deposits from which diatomite is quarried in its crude state are of prehistoric origin. These minute siliceous shells are found in hundreds of different types, sizes and shapes in pure form. Through highly controlled processes of crushing the blocks from the quarry, blending, milling and distribution, various degrees of fine and coarse fractions are obtained. At various points the "natural" powders are ready for packaging.

Due to the non-absorbent nature of diatomaceous earth, oils filtered through this porous mass do not lose the additives and components



PRESSURE TYPE FILTER with cutaway showing filter tubes with precoat material. Liquid is forced into the tubes and the filtered fluid is drawn off through a manifold at the top.

MAGNETIC SEPARATOR which uses the flat bed principle with the largest concentration of Alnico No. 5 Magnets.

which give desirable characteristics to the oils and coolants. Thus, the use of diatomaceous earth as a filter aid assures complete filtration without alteration of the fluid compounds.

Diatomaceous earth is automatically or manually added to clean oil forming a slurry mixture which precoats the screens before the start of the filtering cycle. The contaminated precoat is discharged from the screens in the same manner as the sludge deposits described earlier.

Vacuum-Type Filters

The basic filtering elements of vacuum-type filters are similar to the pressure-type units. The difference being that a vacuum is created within the manifold header box and the screen tubes. The filtration and flow through the screens is accomplished through atmospheric pressure opposite the vacuum created.

A newly developed vacuum-type filter has improved this process to an extremely high degree of efficiency. This unit consists of a divided tank, one portion containing the suspended tubular screens and vacuum header box and the other portion serving as a clean fluid reservoir. The dirty liquid enters the filtering compartment near the bottom and is drawn through the tubular screen into the vacuum header box. It is carried through a special 4-way valve, through the pump and into the clean coolant storage reservoir.

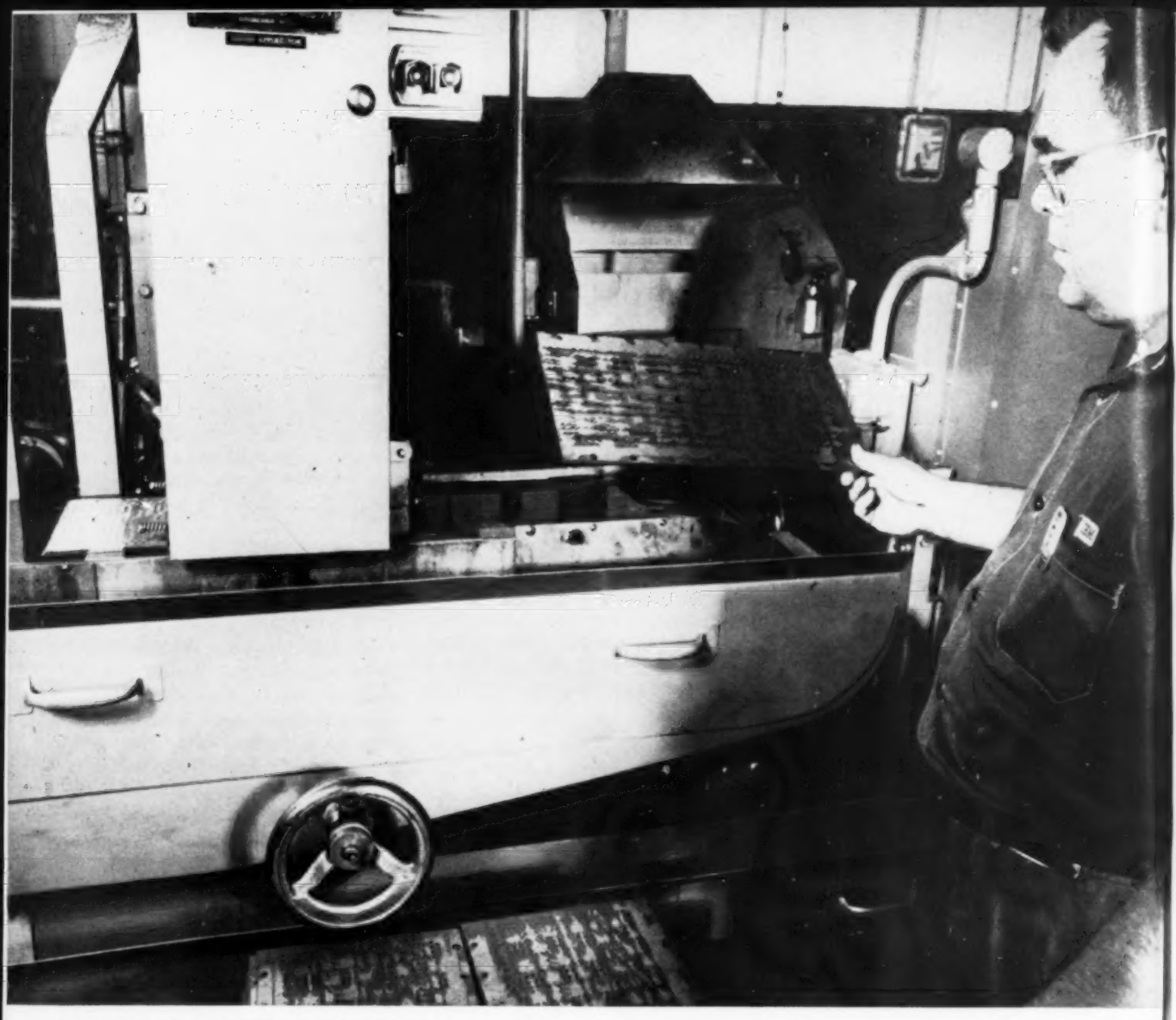
As the deposits accumulate on the tubular screens the flow is restricted causing the level of the contaminated fluid to rise. A float actuates a solenoid switch, at a predetermined level, which controls an air valve. The air valve reverses the 4-way valve and clean fluid is drawn from the storage reservoir and forced into the header box and tubular screens. The deposits on the screens are forced off and fall to the bottom of the contaminated liquid reservoir. Chain driven flights remove these deposits and carry them up a ramp, out of the tank and deposit them into a disposal box.

Back to Filter Cycle

As the cycle is completed, the 4-way valve is again returned to the filtering cycle until the level of dirty liquid rises and the cleaning cycle is repeated. This new unit performs filtration to such an efficient state that micronic filtration may be achieved without the use of precoat filter aid.

Filter aids, however, may be used with this unit. A special automatic precoat feeder equipped with a shaker device to prevent bridging is supplied and feeds a predetermined amount of filter aid.

The advantages of this unit are in its compact design, high flow rates (5 to 1000 g.p.m.) and efficient operation. • • •



COPPER-CLAD PHENOLIC sheets, loaded by operator on upper-level conveyor belt, are carried under first grinding head, turned over automatically, and conveyed to second head (behind operator). Stock removal, each side, is .0002-inches.

Multiple-Belt Grinder Finishes SAGE Panels

Production of copper-clad circuit boards for the complex SAGE defense computer at IBM's Military Products Div. has been speeded by use of belt grinder to remove electrolytic graphite.

● Installation of a two-level conveyor-type belt grinder, permitting high speed surfacing of both sides of copper-clad phenolic sheets in a single pass, has resulted in a sixteen-fold production increase at the Kingston, N.Y., plant of IBM's Military Products Division. The machine, developed by Engelberg

PRIOR METHOD of removing graphite from copper-clad phenolic sheets. Panels were ground under water by pneumatic sander.

Huller Company, is equipped with two conveyor belts, one above the other, and a gravity-feed turnover device.

For Computer

The laminated phenolic sheets, 1/16″ x 18″ x 9″, are used in the manufacture of the thousands of printed circuit cards used in the IBM SAGE Computer, the heart of the U. S. Air Force's Semi-Automatic Ground Environment (SAGE) System for the nation's air defense.

These sheets are purchased with copper foil, .0012 inches thick, laminated on each side. The holes required for mounting electrical components are then pierced in the sheets and a graphite coating is applied. Sheets must then be surfaced so that graphite remains only to coat the walls of the holes pierced in the sheets. This graphite coating gives the necessary electrical continuity from one side of the sheet to the other so a conductor may be plated through the holes.

Formerly, the sheets were sanded under water by hand, with a pneumatic oscillating hand sander. Sixteen man hours were required to meet daily production. Now, with the belt grinder and one operator, production time is reduced to one hour a day.

400 Per Hour

The machine operator places the panels on the upper-level conveyor belt, 107″ x 11″, between the two grinding heads. Parts are carried under left-hand grinding head, flipped by means of a gravity-feed turnover device, moved along on lower-level conveyor belt, 206″ x 11″, to right-hand grinding head, and accumulated in ejection tray. Speed of the 120 grit silicon carbide conveyor belts, adjustable from 2 to 25 feet per minute, is set for circuit panels at 17 feet per minute, for a surfacing rate of 400 sheets per hour.

Removal of graphite from copper-clad surfaces requires precision stock removal of .0002-inches from each side. Depth of cut is controlled by micrometer adjustment of grinding head. Lower head is simply set .0002-inches closer to the conveyor belt.

Positive Feed

Size of abrasive belts, which are 240-grit silicon carbide wet cloth, is 10″ x 92″. Abrasive belt speed is 5500 surface feet per minute. Hold-down rolls are mounted on either side of each head to insure positive feed of sheets under grinding head.

The machine's self-contained coolant system applies coolant—water with rust inhibitor—directly to work area, and also sprays it forcibly across the full width of abrasive belt to prevent belt loading and prolong belt life. IBM reports a belt life of 750 panels per belt. • • •

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Surface Grinding

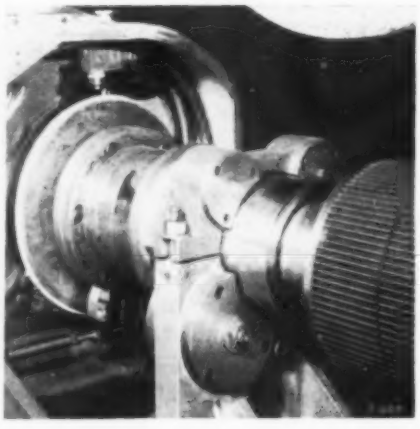
HORIZONTAL SPINDLE—RECIPROCATING TABLE

IN THIS SERIES—

1. ADVANTAGES—APPLICATIONS—ECONOMICS
2. FUNDAMENTALS AND METHODS
3. MACHINES, ATTACHMENTS, SPECIAL DEVICES
4. WHEEL SELECTION AND WHEEL FORMING
5. CAUSES OF FAULTY SURFACE GRINDING AND CURES

Part 5: Causes of Faulty Surface Grinding and Cures

Prepared by the editorial staff of GRINDING and FINISHING and Edmund Mottershead of Mottershead Associates.

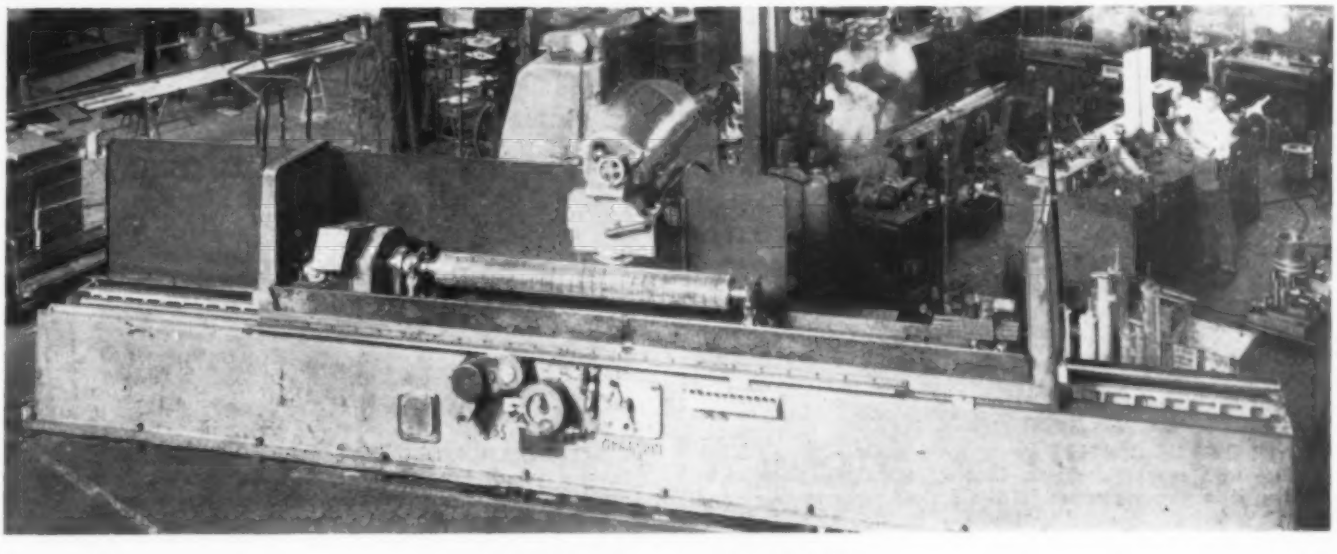


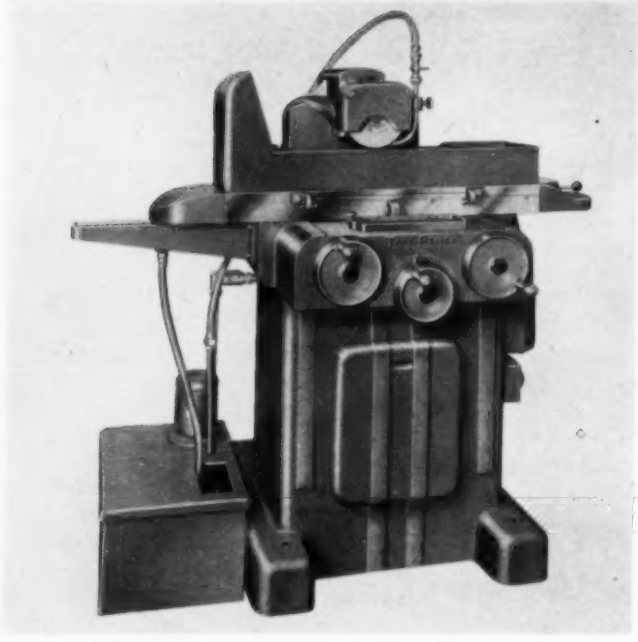
GRINDING FLUTES in corrugated paper manufacturing rolls. These rolls range from 68" to 132" in length and from 8" to 16" in diameter. They are approximately .005 larger in diameter at the center than at the ends. Photo at left above shows close-up view of the shape of the roll, as well as the steady rest and automatic indexing device. Photo at right above shows double diamond automatic wheel truing device which is cam operated to generate true tooth form. The machine is equipped with automatic downfeed, automatic indexing cycle with a table speed of 10' to 100' per minute. Coolant used is conventional water soluble coolant applied completely through the grinding wheel in order to keep any heat of grinding out of the roll. Wheel is 20" diameter x 1" face x 12" hole with full temperature control on the hydraulic system.

● Any attempt to trouble-shoot grinding problems and avoid the more common difficulties encountered in production surface grinding must be predicated upon a firm understanding of just what constitutes "injury" to the workpiece.

It must be emphasized that the observation of some change in the appearance of the work after grinding, either by burning, burnishing, or cracking as shown by any of several tests, does not necessarily mean that the piece has been injured.

Only when the usefulness of the piece in actual service is proved to have been affected unfavorably can there be any talk of injury. For example, low carbon steel is not injured by burning it during grinding unless it happens that the surface stresses associated with the high temperatures causing the burn are





SURFACE GRINDER with wet grinding attachment. Attachment consists of a coolant supply tank and motor driven pump, splash guards and drain trough, and wheel guard. Coolant supply tank is of welded steel construction, with baffling for proper settling. The manufacturer recommends factory installation of this equipment on the machine.

TOOL ROOM SURFACE GRINDER features telescoping guards covering vertical ways, elevating hand wheel with .0005 graduations and vernier set for .0001 adjustments. The manufacturer has a special plating process whereby a hard chrome surface is applied to Vee bed and table ways. Surface is applied after ways are hand scraped from a master plate.

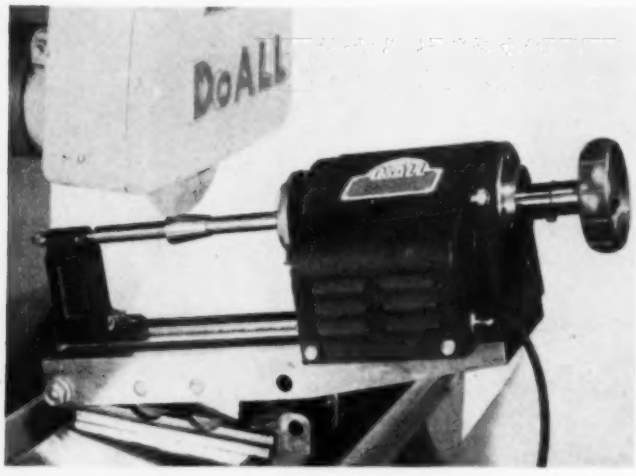
great enough to distort the piece more than is permissible. Even surface cracks are not injuries unless the piece fails to last as long and do as good a job in actual service as it would if not so cracked.

Detection of possible injury by testing for cracks and observing burns and stresses is only part of the problem. Injurious changes in the piece must be detected in order that they be avoided, but changes in the observable condition of the piece are not automatically injuries under all circumstances. If past experience does not indicate whether a given change, such as burn, denotes actual injury to the usefulness of the piece, then tests should be run. Otherwise zealous inspectors will be scrapping large quantities of valuable and useful pieces.

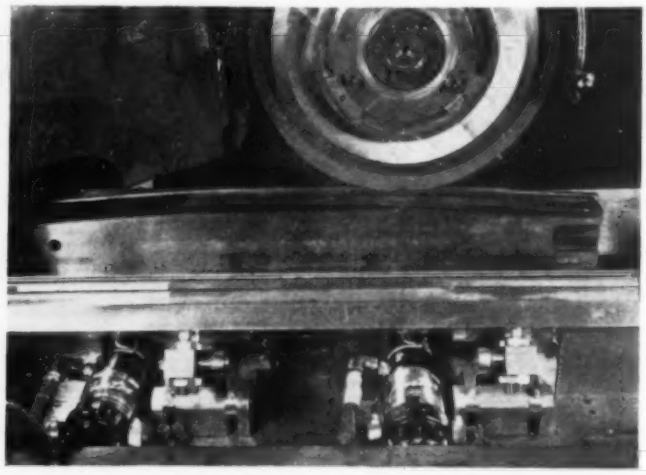
Stresses in the Wheel Face

Ideally, a grinding wheel is selected to be nearly self-sharpening. Thus, as the abrasive grains are dulled, they will fracture and present fresh sharp cutting teeth to the work. Similarly, the pressure of the work against the wheel tends to break down the bond between grains and allow worn grains to fall out, exposing new and sharp grains for better cutting.

The character of the abrasive points and their readiness of fracture, the hardness of the bond and strength with which it holds the grains, and the stresses set up in the wheel face by the various movements and relationships of wheel, work, and machine, determine the degree to which the wheel will be



POWER DRIVEN CENTERS mounted on angle-adjusting block for use with magnetic chuck. Centers rotate the piece while holding it in proper position for the desired taper to be ground by the wheel.



CONTOUR AND SLOT grinding job, chain saw guides. Groove in edge of part must be ground to uniform depth. Two parts are ground at a time, with 4 wheels on common spindle. Cam-operated fixture generates shape by rocking part.

self sharpening and will cut at optimum efficiency.

We know that, in order to make a wheel act "harder" on a given grinding operation, we may do one of three things—or a combination of them—(1) Decrease the wheel's infeed or downfeed into the work; (2) Decrease the traverse rate of the work; (3) Reduce the work speed and keep wheel speed constant, or increase the wheel speed and keep the work speed constant.

Similarly, in order to make the wheel act "softer" we reverse these effects: (1) Increase the downfeed into the work; (2) Increase the traverse rate of the work; (3) Increase work speed and keep wheel speed constant, or decrease wheel speed and keep work speed constant.

Fundamentally, injury to the work piece, or some change in its appearance, is due to some aspect of wheel speed, work speed, or downfeed not being properly coordinated with the rest of the process so that the wheel is acting either too hard or too soft.

Pre-Grinding Processes

In addition to the various factors in the grinding operation itself which may bring about damaged work, there are a number of operations usually made on a piece of work before it is ground, such as heat treating, which have direct effects on the quality of work done in the grinding operation. Grinding, of course, gets the blame because the injury is visible after the grinding operation.

However, it is frequently too late to do anything about the previous operations of processing on the work, and all that can be done is to modify the grinding operation suitably.

Steels which crack readily during or after grinding are said to be sensitive to grinding, which simply means that they are brittle under grinding conditions although not necessarily brittle under other conditions. This brittleness may spring from a number of factors.

If steel is not tempered after hardening, it contains untempered martensite which is brittle and easily cracked on grinding. Tempering a plain carbon tool steel at 300° F for one hour is enough to make it less susceptible to cracking during or after grinding. Oil hardening tool steels should be tempered at slightly higher temperatures. High speed steel with considerable retained austenite should be tempered at 1050° F, causing the austenite to convert to martensite upon cooling to room temperatures. A second tempering at 1050° F eliminates the inherent brittleness of the martensite and prepares this type of steel for grinding.

Other difficulties encountered in grinding occur in the case of steels which have been surface hardened by carburizing and quenching. Similarly, steel which has been decarburized is occasionally difficult to grind because the low-carbon surface layer is soft and tends to fill or glaze the wheel which then hits the harder underlayer and runs into trouble.

Another pre-grinding difficulty sometimes occurs when parts are machined in prior operations and have been delivered to the grinding machine with humps or high spots on them. If these go unnoticed by the operator, there is in these high spots an excess of metal to be removed, automatically making the downfeed on the initial cut too great at those points. Such parts can be ground successfully if the high spots are removed first without too heavy a downfeed.

Types of Injury—Cracks

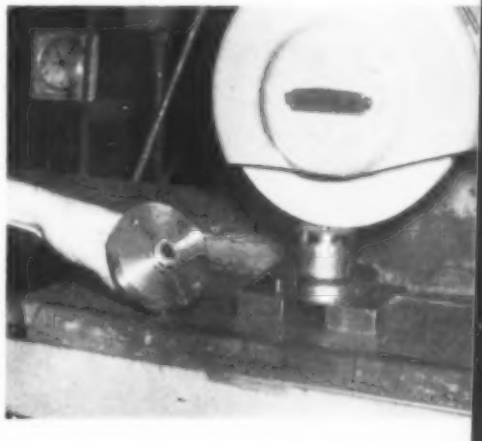
According to Dr. L. P. Tarasov of the Norton Company Research Laboratories, the most serious injuries to be found in ground parts are cracks. This is because cracks are areas of weakness likely to make the part fail prematurely in service.

Surface cracks do not always enlarge themselves, and the piece sometimes lasts as long and delivers as good service as one not cracked. However, only an engineer who carefully studies the behavior of the particular part can make such a determination. Generally, it is best to assume that cracks in ground surfaces should be avoided.

It is, of course, necessary to distinguish between the cracks created in heat treatment of the workpiece

BRASS PIECES on the magnetic chuck can be prevented from sliding by bracing them with steel blocks. Most small steel pieces should be braced with blocks, also.

PROPER RELATIONSHIP between character of wheel, wheel speed, rate of downfeed and rate of table traverse make for successful surface grinding. Out-of-balance relationship of any of these factors can result in burn or cracks on the work.



LAMINATED MAGNETIC PARALLELS solve the problem of holding work which has hubs, bosses, or other projections. Intelligent use of blocks and similar simple devices aids production on the magnetic chuck.

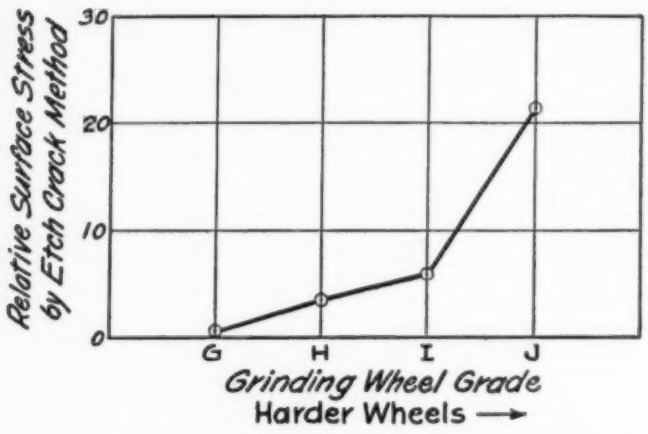


Figure 27. Effect of wheel grade on grinding severity, as shown by relative stress introduced into the ground surface. High stresses indicate possibility of injury to the surface. (See text for details)

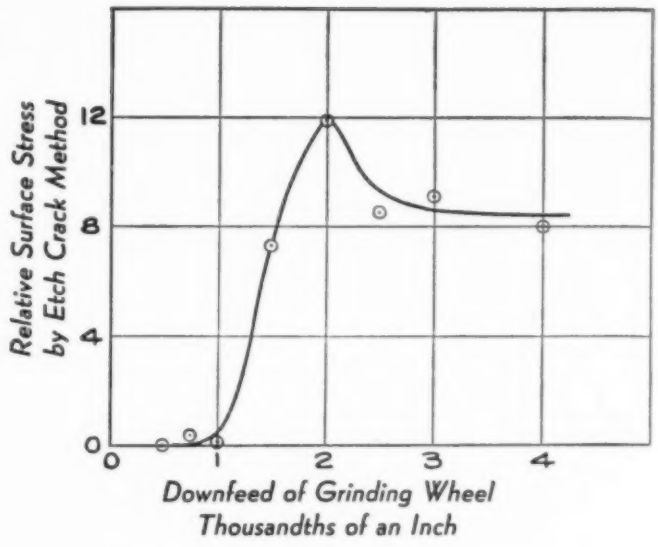


Figure 28. Effect of downfeed on grinding severity

prior to grinding, and those caused during the grinding process. Even though the heat treating cracks are seldom seen until the surface has been cleaned up by grinding, they are characteristically deep, fairly long, and on a large scale, while the cracks from grinding are much smaller and usually have some relationship to the grain marks left by the wheel.

Stresses in the Work

A ground surface may be free from cracks and still be injured because the heat of grinding has stressed internally beyond what is tolerable for the use to which the piece will be put. Surface stresses occur only in the top layer of the work, usually in a layer only a few thousandths of an inch deep. Extreme stress will distort the piece, particularly if the sections are thin.

Where the work is heavy and thick, its own rigidity will usually be sufficient to overcome stresses induced in the surface by grinding, at least as far as distortion of the piece is concerned. The practical significance of surface stress in ground pieces is that it may lead either to distortion or cracking. In addition, the part might fail in use under conditions of severe alternating stresses. In the majority of work, grinding stresses do not have any noticeable effect upon the usefulness of the ground part under operating conditions.

Burn

The third type of grinding injury is burn. Mostly, this is a visible discoloration caused by an extremely thin film of oxide formed during momentary exposure of the area to high temperatures. While the same colors may be produced at lower temperatures during normal tempering, the chief difference is in the high temperatures at which grinding burn is produced.

Except for the appearance, burn of itself is not necessarily injurious, since the thickness of the oxide layer is on the order of millionths of an inch. It is, however, looked upon as a danger signal.

The heat of grinding may temper hard steel, either in spots or in the whole surface layer, causing soft skin. At higher temperatures, the steel surface may harden if it had previously been annealed, or it may reharden if it was already hardened to start with. A hard surface caused by grinding may result in tool breakage in use. Hardened steel rehardened under grinding processes will be unusually brittle because the rehardened areas are not tempered. Even though the visible burn is cleaned off in the final grinding passes, the harmful effects, if any, remain in the work.

Factors in the Grinding Process

In continuing his analysis of grinding injury to the work, Dr. Tarasov states: "Cracks, stresses, and burn are all caused by excessive heat produced in the steel at the point of contact with the grind-

RADIUS AND ANGLE diamond dresser. Point of diamond must be set at angle to the wheel and above or below center. Point should be rotated a quarter turn or so every few times it traverses the face of the wheel to avoid developing a flat spot.

CRUSH FORMED WHEEL is dressed after each few passes on this motor-driven crush dresser. Wheel idles while dresser does the work.

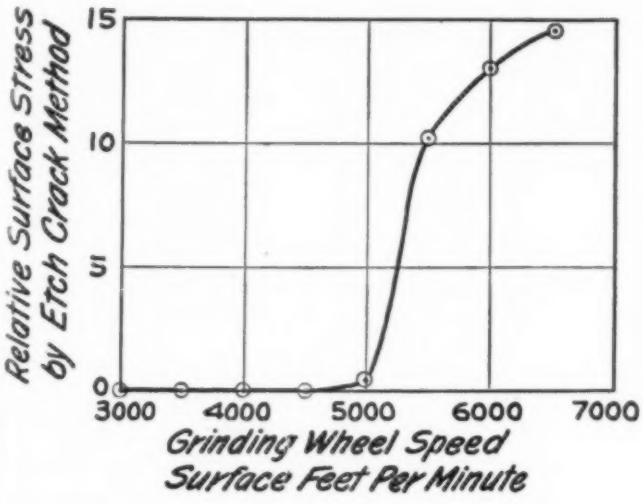


Figure 29. Effect of wheel speed on grinding severity

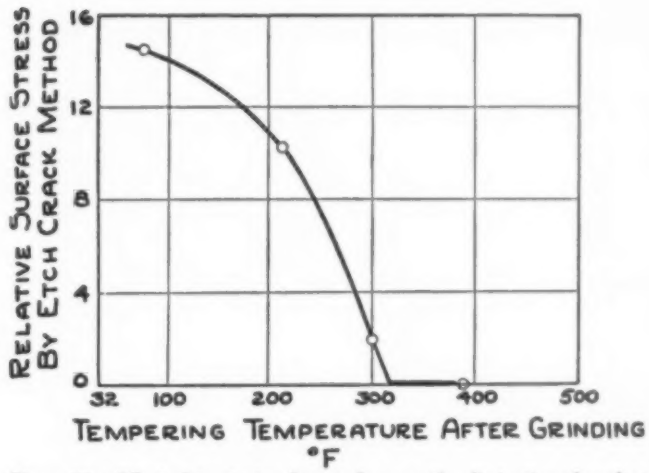


Figure 33. Effect of tempering for one hour on the elimination of surface stresses, whose magnitude was determined roughly by the etch-crack method

ing wheel. Some heat is inevitable since it is developed in cutting out tiny chips of metal and plastically deforming them until they break away from the surface. In addition, there may be rubbing or frictional heat, which serves no useful purpose."

A dull wheel always generates more heat than a sharp wheel. Even when the abrasive grains are sharp, however, considerable heat will be developed if the wheel is loaded. Metal particles in the surface of the wheel causes metal-to-metal friction and heat.

The only answer is to dress the wheel properly for the desired amount of stock removal. If stock is removed rapidly with a wheel dressed for fine or finishing cuts, cracking or burning of the work is likely.

The size and shape of the pieces being ground may affect the condition of the wheel face. It has been noted that when grinding many small pieces, the repeated contacts of the wheel with their leading edges in the grinding process tends to keep the wheel sharp even though the same wheel might prove too hard and glaze while grinding larger pieces of steel with the same total surface area. A softer wheel would be needed to work the larger pieces without injury.

The condition of the wheel is also influenced by the coolant. Normally, work surfaces suffer less under wet than under dry grinding. There are, however, classes of work such as extremely hard high-speed steels which grind better dry than with soluble oil coolants.

Sometimes it proves true that injury to the work can be avoided by shifting from standard soluble oil to straight grinding oil, which is generally known to keep the abrasive grains sharper. The machine, of course, must be suitably modified for use with straight grinding oil.

Choosing a wheel of the right grade is one of the most important factors in avoiding injury to the work. Too hard a wheel will burn it or crack it, while too soft a wheel will wear too rapidly. The best wheel for precision grinding of hard steel is one that is as hard as possible and yet does not injure the work.

Wheel specifications other than grade may also determine whether or not the wheel will cause injury. The type of abrasive is important, in particular with the newer high alloy steels. It has even been known to happen that a wheel of too hard a grade injures the work and is still too soft because it wears out too rapidly, simply by having the wrong type of abrasive.

Grit size and structure or spacing of the grits is also influential in determining whether the wheel will injure the work.

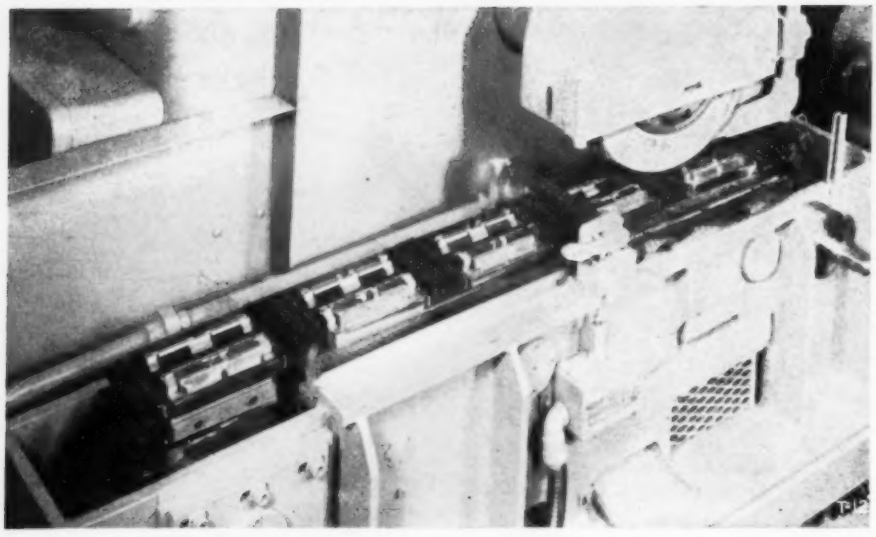
Machine variables which change the severity of grinding involve variations in infeed or downfeed, variations in wheel speed, and variations in either table or wheel traverse. It is apparent from tests involving increasing downfeed and measuring severity in terms of surface stress that severity rises to a peak from small downfeed to a peak at about .002 downfeed and then drops off slightly at heavier downfeeds. Seemingly, the wheel becomes progressively duller to the .002 point of downfeed, beyond which the deeper cut exerts greater and greater pressure, tearing the dulled grains from the surface and sharpening the wheel again—at least on the wheel used in test runs. Light feeds may burn the work where a heavy feed will not.

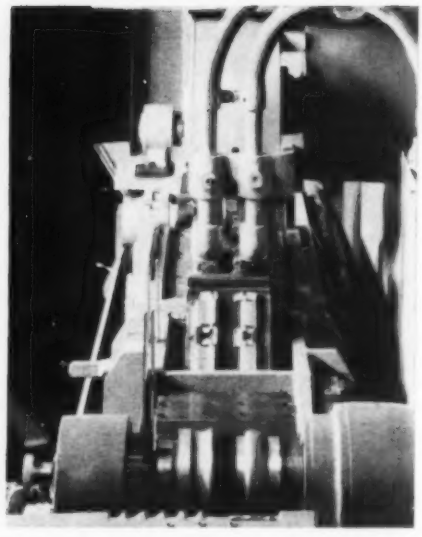
Considering traverse or table speed of work, a low speed is much more likely to permit injury of the work than a fast speed. The reason is that the wheel stays much longer in one spot and more heat must be absorbed right there.

Slower wheel speeds, making the wheel act "softer" results in a drop in surface stress. Coolants, generally, permit less injury than dry grinding; however, if coolant is insufficiently or unevenly applied, it may result in a sudden quenching effect and worse damage than that from dry grinding where the piece is allowed to cool slowly and uniformly.

Operator Troubles

In the effort to make machines more and more independent of the human factor, we come to the human factor in terms of production incentives. Men engaged on piece work are generally found best served with harder, more durable





CRUSH FORM GRINDING the concave and convex sides of truck torque converter blades. The fixture holding the pieces is unique in that the parts are located on trunnions at each end of the blade and are automatically unloaded after they have passed the grinding position. The operator merely loads the parts into moving pallets, thus achieving continuous grinding operation. The actual contour to be ground is shown on the crushing rolls in the photo at right. Two rows of parts are ground at once, one for the concave and one for the convex side. Work speed was approximately 3 inches per minute with a single pass of the part under the wheel to finish size.

grades of wheels than are those paid by the hour. The tendency to "bear down" to get out production is counteracted by management by handing out harder wheels. Both the harder wheel and the drive for higher production can result in troubles, more commonly found among piece workers than among hourly workers on grinding machines.

Operators, in their eagerness to get out production, are sometimes apt to overlook the seemingly unimportant things that usually cause trouble. Often, the operator's first impulse is to blame the grinding wheel if the work is not flat or the finish not perfect. Other troubles which beset the operator can be traced to improper machine adjustment, improper maintenance, an improper method of holding work on the table, the condition of the magnetic chuck, or to some basic error in grinding procedure.

Work not flat

Flatness of work to a few thousandths may be acceptable in some jobs, yet flatness measured in light waves may be necessary on the next. For best flatness, the work should be reasonably thick, as a piece with thin sections may warp or spring slightly during grinding. Extremely thin, flat pieces, are the worst of all in this respect.

The pull of the magnetic chuck on a thin piece may be sufficient to temporarily straighten out the piece and defeat the purpose of the grinding. In such cases, it can sometimes be ground without magnetizing it, simply blocking the work at both ends with heavy blocks.

For the best possible flatness and finish, take very light cuts on finishing passes to avoid overheating and distorting. Be sure to have and maintain a sharp wheel face, using a wheel of proper grade and grit, and dressing it frequently with a diamond. In some instances, it may be necessary to rough grind within .005 or less and then finish grind with either a finer wheel or with a wheel dressed more finely.

Be sure the work is free from internal and surface stresses before finishing. Heat treated work can be stress relieved by rough grinding. If the rough grind leaves the thin piece slightly distorted, pack the work with paper strips or shim on the magnetic chuck and grind one surface flat; then finish grind the second side flat and parallel with the first.

Immersing heat treated work of small cross section in boiling water for 4 or 5 hours will also stress-relieve it between rough and finish grinds. Needless to say, in order to produce perfectly flat work, the magnetic chuck should be wiped off and slightly stoned before loading the next piece.

Grooves and Slots

Grinding flat surfaces containing grooves or slots is an exacting job. To keep the edges of the grooves absolutely square, the wheel must be sharp and free cutting throughout the grinding cycle. Any dulling of the wheel causes pressure to be built up and when the wheel approaches a groove, the reduced contact area permits the wheel to cut deeper, thus destroying the flatness and squareness of the oil-seal surface.

Out of Parallel

Lack of parallelism is usually due to some inaccuracy that has developed in the face of the magnetic chuck. Check the chuck for roughness. Rub it lightly all over between jobs with either a fine grit India or Crystolon oil stone to remove any burrs that may have been thrown up by rough castings. Regrind it as soon as it has become scratched or worn. Use a dial indicator clamped to some part of the work head to check it. Lower the wheelhead and traverse the table, watching the indicator. The maximum variation should not exceed .0005 if the chuck has been properly ground.

Make sure the work rests flat and firm on the chuck. Do any packing or shimming before magnetizing the chuck. If the work is

a rough casting, file it or grind it on a disc grinder to a reasonable flatness and smoothness before putting it on the chuck.

Out of parallel work can also result if the truing diamond is not tight in its holder. If the dresser fastens to the wheel guard, make sure it travels across the face of the wheel parallel to the spindle. For the greatest accuracy, the truing slide should operate one way only, either in or out. Do not permit the wheel to run entirely off the work at the end of the cross feed, as this will cause the edges of the work to become slightly rounded.

Work out of Square

To grind work square, common procedure is to grind two sides parallel, and then hold the work in a vise at right angles and grind a third side square, then turning it over to grind the 4th side parallel to the opposite side. If the work is odd-shaped, pack the bottom side so that one side will be perpendicular to the table, using a toolmaker's solid square to check this.

Scratching of the Work

Irregular scratches are frequently caused by dirty coolant or by loose particles of dirt from underneath the wheel guard. It pays to take time to flush out the wheel when changing wheels.

Clean the coolant tank frequently and add water or coolant from time to time in order to have an ample flow. If the tank is dirty and full of sludge, the work may overheat because a small amount of coolant is recirculating very rapidly and not dissipating the heat fast enough.

If the grinding wheel is too soft, abrasive grains released from the wearing wheel may roll between wheel and work and cause irregular scratches. The wheel also may simply be too coarse to give the required fine finish.

Improper wheel dressing with the diamond will cause a pattern of diamond marks, as they are called. Be sure the diamond is not cracked or loose in its mounting, and give it a quarter turn every few dressings to avoid formation of a flat spot.

Do not slide the work off the magnetic chuck, as this will scratch both work and chuck. Lift it off after demagnetizing the chuck. Sometimes a jet of air squirted under the work will serve to break the suction between piece and chuck. Another trick is to put another block or piece on the chuck first to diffuse the residual magnetism of the chuck. Sometimes a sheet of thin paper can be laid on the chuck first, before placing the workpiece on it. This makes it easier to remove the piece and avoid scratching, in case the machine isn't equipped with neutralizing chuck controls.

Chatter marks

Chatter marks are usually caused by vibration. This may be from any of several conditions, such as worn or improperly lubricated spindle or other vital moving parts, wrong traverse speed, wheel out of balance, wheel out of truth, wheel too hard, lack of solid footing for the entire machine, proximity to vibrating machinery elsewhere on the floor.

On light finishing cuts, the grinding wheel may sometimes become glazed, dulled, and leave chatter marks. Correct this by redressing the wheel and take the minimum number of passes possible to obtain the desired finish.

Some machines have balancing type wheel sleeves. On these, balance the wheel assembly before starting to grind with a new wheel. Be sure also to rough true the wheel on the machine before balancing it on a balancing stand and then finish true it on the wheel after remounting it in its newly balanced condition.

Wheel loading

Bits of metal lodged in the surface of a wheel indicate a loaded wheel. Use either a coarser grit or a porous type to provide more chip clearance, or a softer grade which will break down more easily. If the wheel is loading because it is too hard, try increasing table speed. If loading persists, check the diamond for sharpness and give the wheel a very coarse dressing using relatively heavy feed and rapid traverse. Check the coolant to be sure it is clean and serving as a good detergent.

Wheel glazing

A glazed wheel may be noticed by its shiny surface and slick feel. If wheel specifications are to blame, use coarser or softer wheel, or increase the table speed to promote a more rapid breaking down of the wheel with consequent exposure of more cutting points. Too light a feed or too oily or insufficient a coolant will cause a wheel to dull and glaze.

Wheel too hard

In selecting wheels for any job, remember that it must be soft enough to wear away and keep itself sharp. It is a common mistake to use too hard a wheel, in the interests of "wheel economy," with the result that the abrasive grains remain in the wheel long after they have become dulled, with consequent burning of the work and other troubles. At this point, severe and usually wasteful dressing is required in order to be able to use the wheel at all.

Work sliding on the chuck

Stops of some sort must be used to prevent many types of work from sliding. The magnetic chuck holds pieces down, but does not prevent them from sliding sideways except by friction between the piece and the chuck face. Always block light pieces to prevent the work from sliding or spinning. Vises, steel blocks, and a wide variety of work holding devices have been developed for special jobs of all kinds. • •

End of series.

The Editors are indebted to the following companies whose cooperation made this article possible:

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Getting the Most from Your Abrasive Belts

It pays to review your belt grinding and polishing jobs once in a while, to see if methods, materials, or simply personnel changes are affecting performance.

You'll want to check:

- ✓ *Cutting Speed*
- ✓ *Contact Wheel*
- ✓ *Polishing Belt*
- ✓ *Grit Sequence*
- ✓ *Grease Application*

by **Herman Reichardt,** consultant

● Do you need to review your abrasive polishing jobs to see if changes in personnel, materials or other factors have decreased performance?

Many a company uses abrasive belts properly, even developing their own methods for cutting costs, increasing output per belt or improving quality. And in cases where belt polishing jobs are carefully controlled, it's surprising what you can get out of these versatile tools.

It often happens, though, after a belt job is set up and running well, that new foremen or operators may allow methods changes to creep in and spoil the original good performance. Sometimes the material to be polished is changed, without a corresponding change in procedure.

Take the case of one aluminum castings manufacturer who called for a field engineer of a coated abrasive plant, complaining urgently about a drop in belt output of 50 to 80 per cent of normal. For years these cast-aluminum parts had been pre-polished with 80 grit aluminum oxide abrasive belts of the resinoid type, using a serrated rubber contact wheel, medium soft. The wheel was 18 inches in diameter, run at 1500 rpm.

The original operation sequence followed from belt polishing to final buffing prior to anodizing, was:

(1) 80 grit belt, aluminum oxide resinoid, 184-in. x 2-in.

(2) 240 grit belt, same type and dimensions.

(3) Buff, cutting down.

(4) Buff, coloring.

(5) Cleaning.

(6) Anodizing.

Output on the 80 grit belt, on rough polishing a casting of 30" x 20" dimensions, had dropped from eight pieces per belt to two pieces per belt in a period of nine months. When the job was checked, the following conditions were discovered:

(1) The amount of grease compound being used was too small to keep the belt free from aluminum loading. Grease was applied once during belt life instead of at least twice every five minutes which is necessary.

(2) Grease had been applied in sufficient quantities during the previous years but had been neglected more and more because the operator didn't like a smudged machine and belt. He didn't realize that only excessive use of grease stick causes greasy work and machine. Regular and controlled use of grease works the grease slowly into the belt, leaving the workpiece completely dry and giving the belt a white-greyish appearance. This creates a long-lasting and uniform cutting action of the aluminum oxide abrasive grains, thereby increasing the output per belt several times the figure obtained with a dry belt.

(3) Instead of using more grease to open the belt, a piece of pumice was being used to free the belt from heavy loading with aluminum chips. Pumice actually reduces the loading of belts, but at the same time dulls the cutting points of the abrasive and finally reduces the initial output per belt severely.

Proper Procedure

With operators properly trained, aluminum castings were manually polished as follows:

(1) 80 grit belt, aluminum oxide abrasive, resinized type. Use grease stick whenever cutting action diminishes. Don't use excess grease, because belt will load with grease and work will skid on the belt surface.

Don't use too small an amount of grease. The belt will load with aluminum chips and quit cutting.

(2) Don't use materials harder than aluminum for generating belts, when grinding and polishing this material. Thus you can avoid a

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Getting the Most from Your Abrasive Belts . . .

drop in output. Don't use dressing sticks either.

(3) Check your belt polishing department from time to time to insure:

a) Proper cutting speeds.
b) Proper belt type (demand latest recommendations from your belt manufacturer from time to time).
c) Proper grit sequence.
d) Proper application of grease compound, pressure, contact wheel, etc.

In this case, the situation was cleared up by increasing grease application. Output per belt was raised to the normal figure of 6-8 pieces per belt.

Case 2: Steel Tubing Plant

One manufacturer of steel tubes complained about insufficient surface quality of his 12-in. by 1¼-in. tube parts, claiming scratches on his chromium plated tubes. Comparatively deep scratches showed up on hundreds of pieces, creating danger of rejects for thousands of chromium plated steel tubes. The situation went off the normal control and inspection means of the manufacturer.

The steel tubes were being polished by 8 heads on tandem centerless belt polishing equipment, the original grit sequence being:

(1) 180 grit aluminum oxide belt, resinized type.
(2) & (3) 240 grit aluminum oxide belt, resinized type.
(4) & (5) 320 grit aluminum oxide belt, resinized type.
(6) 360 grit aluminum oxide belt, resinized type.
(7) 400 grit aluminum oxide belt, resinized type.
(8) 500 grit aluminum oxide belt, resinized type.

Immediate investigation showed that the 360, 400, and 500 grit heads were not giving a true cut. They were idle running, delivering a smoothed-out part without removing scratches left by No. 320 and

even No. 240 heads.

The company was pressing for quick handling of the problem without interrupting production. An immediate change of grit sequence was ordered:

(1) & (2) 240 grit, same belt type.
(3) & (4) 280 grit, same belt type.
(5) & (6) 320 grit, same belt type.
(7) & (8) 400 grit, same belt type.

Reason for the change of grit numbers was explained this way: Two controlled grit 240 belts do more than one 180 grit belt. Two belts of 280 grit will remove scratches caused by No. 240 at a 100% rate. Accepting 320 grit, used twice, as the correct intermediate polishing element between 280 and 400, the subsequent belts 400, again used twice, will yield a sufficiently fine surface to be bright copper plated. The 500 grit was found useless in this application.

Application of grease on heads 4, 6 and 8 was recommended, all remaining belts left running dry. Heads 1 and 2 were recommended to be used for correcting bad or damaged tube material, in case change to coarser grit numbers was in question. In this case grit No. 220 should be applied instead of 240, or, eventually, serrated rubber contact of higher density along with the original No. 240. Instead of the normally used compressed canvas wheel, one of higher density.

Heads 3 through 8 should remain unchanged to secure a controlled surface quality at the end of the polishing line.

The method recommended and demonstrated on the spot worked well, delivering some 600 feet of tube material per belt up to specifications.

Further details:

MATERIAL: Seamless steel tube sections, 12" by 1'5".

CONTACT: Compressed canvas, high density, 18" x 2" for fine grit. Serrated rubber wheels for heads 1 and 2, when polishing damaged material, when necessary applying 220 grit on heads 1 and 2.

RPM: 1500 each head.

BELTS: 184" by 2", aluminum oxide abrasive, resinized, X-weight backing, grits Nos. 240 (220), 280, 320, 400.

PIECES PER BELT: 550-600 tubes at the average, reaching about 1000 per belt when polishing excellent material. • • •

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SURFACE GRINDING, like precision grinding on most production machines, is one of the safest forms of grinding. However, a few precautions must be observed. Goggles are always recommended. Wheels should be checked for soundness and balance before running the machine. Guards should be in place. And the work should be fastened down securely on the chuck. Once the job is running right, there is really little hazard. Any unsafe operation of the machine is almost equally sure to spoil the work.

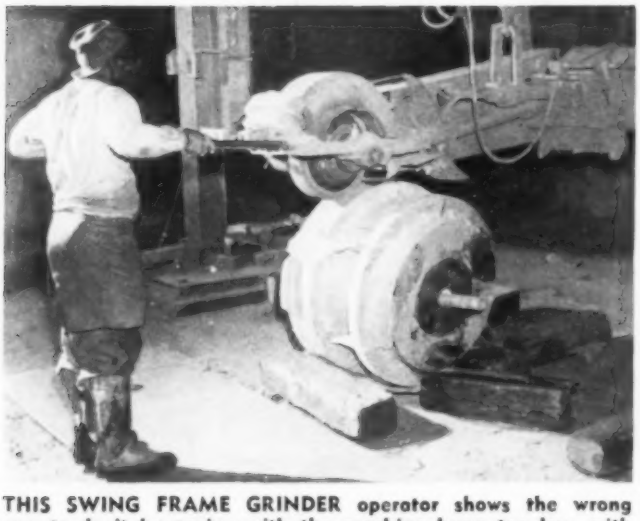
Production grinding almost inevitably involves short cuts and tricks developed by the individual worker to improve his paycheck. Many times these attempts to get greater production involve unsafe practices which can increase wheel cost and endanger the operator.

The operator who fails to take time to check his wheel in surface grinding operations runs the danger of spoiling the work. Similarly, too deep a cut with too fast a traverse may build up stresses by heating the edge of the wheel faster than the center, tending to make the wheel break up inside and crack apart.

Swing grinder operators are sometimes guilty of practices which can be stopped by the foreman on the spot. These include such production-step-ups as grooving the face of the wheel, knocking off corners of the wheel, banging it down too hard on the work in order to take a heavier cut, and increasing pressure by other means. Organic bonded wheels for snagging jobs are sturdy material, but can still be broken down by tactics such as these. It is well to remember that under conditions of abusive operation, all grinding wheels can be broken and can create hazards brought about by such improper operation. •

GRINDING safely

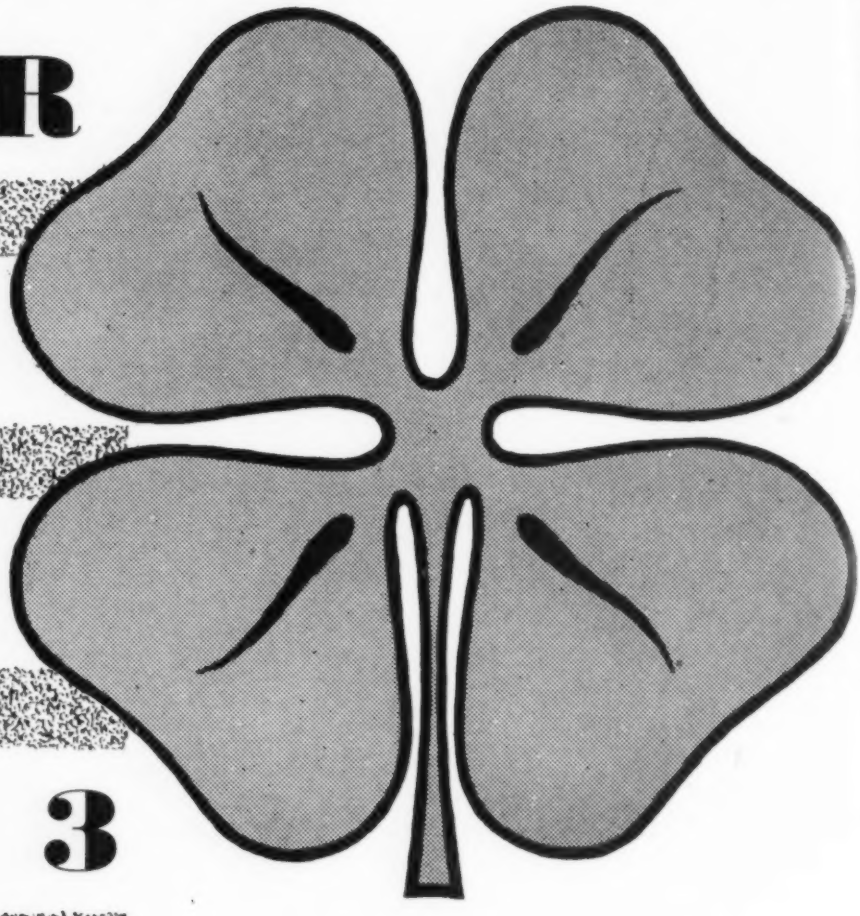
by **Edmund Mottershead,** president
Mottershead Associates, Chicago



THIS SWING FRAME GRINDER operator shows the wrong way to do it by posing with the machine hung too low, with the grinding wheel too low and below the surface of the work. Low position of wheel makes it subject to bumping, erratic operation, and probable wheel breakage. In addition, the position is tiring and awkward for the operator, increasing the chances of accident as fatigue builds rapidly.

CORRECT OPERATION of swing frame grinder for rough snagging includes use of goggles, protective clothing, proper blocking-up of heavy casting so it won't bounce around. Grinder is raised higher so that, with motor end high in the air, operator has comfortable angle from which to manipulate the machine. Less fatigue means greater safety and better production.

CLOVER Abrasives SINCE 1903



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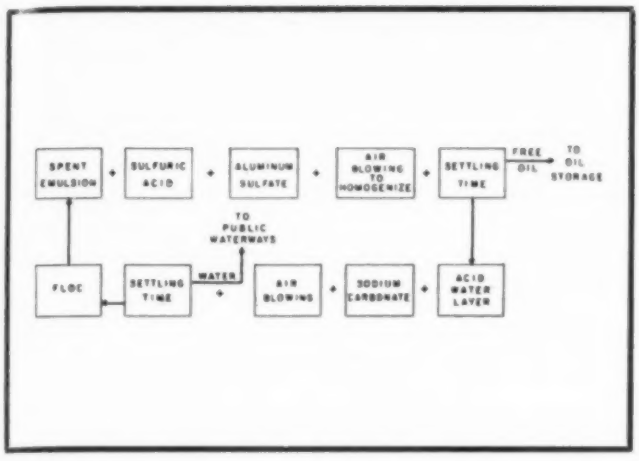
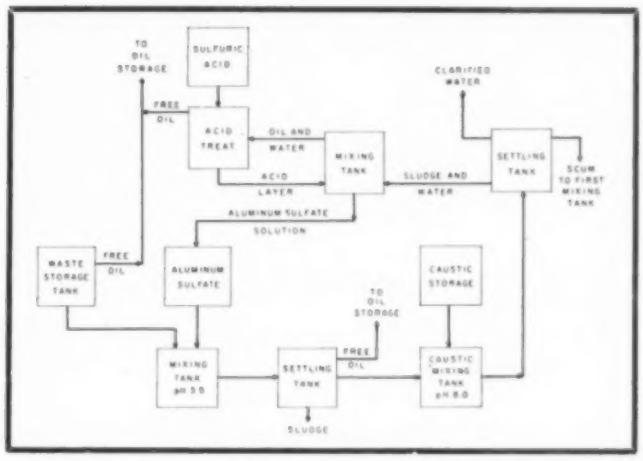


BATCH METHOD of treating spent soluble oil emulsions with sulfuric acid, aluminum sulfate and sodium carbonate.



CONTINUOUS METHOD of treating spent soluble oil emulsions with aluminum sulfate, caustic and sulfuric acid.

Part 2—

How to Dispose of Soluble Coolants

Increasing pollution of public waters is a matter of grave concern for American industry. Cities, states and the Federal Government are tightening their laws on industrial waste disposal. Here's what to do with spent soluble oil emulsions, which have been something of a problem.

by **R. K. Gould** and **W. F. Ball**

Research and Technical Dept.
The Texas Company

The following will serve as an example as to how one plant employs this system of lagooning to clarify their waste. The overall waste is divided into three separate streams, in accordance with previous discussion, namely a storm sewage stream which goes directly to the public waterways, a sanitary sewage stream which is transferred to the city sewage plant, and a stream containing all other wastes which must be treated at the plant. The plant operation is such that the spent soluble oil emulsions can be segregated by themselves, and they are collected and transferred to a concrete settling pit divided into three separate chambers.

The spent emulsions are dumped into the first chamber where settling of the solids and some separation of the emulsion occurs. The supernatant liquid including the separated oil is allowed to flow into the second chamber where additional settling and separation takes place. The liquid from this chamber then flows into the third section where the separated oil is removed. The clarified emulsion then joins the rest of the waste stream on its way to the first retention basin. By utilization of the settling pit, 1000 gallons of oil and two to three cubic yards per month of solids are prevented from entering the sewage line on its way to the first retention basin.

The theoretical retention time in the first basin is approximately two days. During this period, sedimentation takes place and a good portion of the oil separates and rises to the surface. The oil content of the influent to this first retention basin ranges from 750 to 2000 ppm. The oil content of the effluent averages 144 ppm.

The effluent from the first basin discharges through a siphon into a second retention basin where the theoretical detention time is 22 days. This is sufficient to reduce the oil content from the 144 ppm. to about 7 ppm., which is well below the maximum allowable content for that area.

There are a number of chemicals that can be used to treat industrial

wastes containing soluble oil emulsions, and there are a great many ways in which they can be employed, ranging from rather simple to relatively complex systems. In most cases the nature and amount of material to be treated, economic considerations, and ease of handling will dictate the chemicals to be employed and the manner in which they will be used.

The addition of an acid or a salt to a relatively clean emulsion will cause that emulsion to break, and a complete separation of oil and water is usually obtained almost immediately. As the amount of contamination increases, it may become more and more difficult to completely segregate the oil from the water and even upon prolonged standing after the emulsion has been broken, the water layer may contain small amounts of dispersed oil. Experience has shown that when this occurs, the water layer can be clarified by coagulation.

This involves the formation of a precipitate which, upon settling, will take to the bottom all traces of oil and other contaminants present and leave the clarified water in a suitable condition for discharge into the public waterways. Thus, in some instances the treatment required may involve simply the addition of an acid or a salt to break the emulsion and the subsequent adjustment of the water layer to the proper pH. In other cases, a combination of emulsion breaking and coagulation will have to be used to reduce the oil content of the water to the required level. In instances where both methods have to be employed, the chemical used as the emulsion breaker should be one which also can be employed as the coagulant. For example, ferric chloride and aluminum sulfate are both efficient emulsion breakers. Upon the addition of alkali to the partially clarified water containing these salts, insoluble ferric or aluminum hydroxide is formed, both of which are good coagulants.

In order to have the most efficient operation in the chemical treatment of the wastes, it is important that the composition of the waste to be treated remain as near constant as possible from day to day. In order to approach this condition it is advisable that the waste from various parts of a plant be collected in a common storage tank prior to treating in order to allow mixing of the wastes of various compositions and thus keep fluctuations in the compositions of the overall material to a minimum. The use of settling pits should be employed of course, wherever necessary, to remove metal chips and other solid particles.

The following examples will serve to illustrate a few of the general procedures that are being used throughout industry for the chemical treatment of wastes containing soluble oil emulsions.

(1) In one plant the disposal problem consists of handling 50,000 to 60,000 gallons per day of spent acids from pickling and plating operations and about 8,500 gallons per day of a 20:1 soluble oil emulsion. Each of these materials is collected and stored separately to await treatment; the acid in a brick vat, and the emulsion in a tank. The soluble oil emulsion to be treated has been used for purposes other than as a cutting coolant and hence contains no metal chips and does not require the use of a settling pit.

The treatment is batchwise, and the spent acid is used as the emulsion breaker. The soluble oil emulsion is dumped into a brick vat and spent acid is pumped in until the

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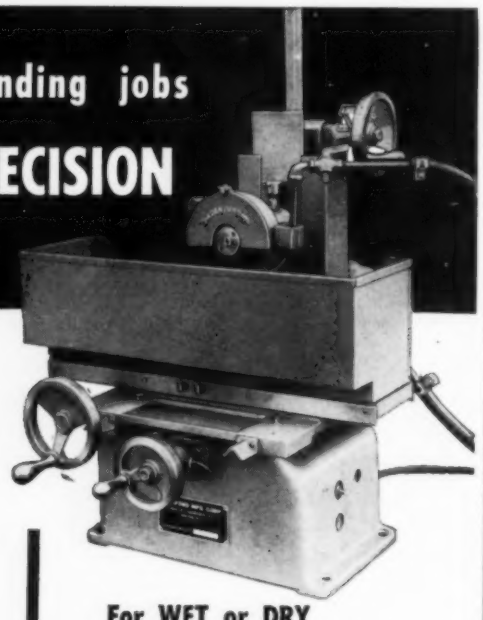

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emulsion breaks. Since there is excess acid available and chemical cost is not a factor, an amount of acid equal to the volume of the soluble oil in the vat is added and a complete separation of the oil is obtained. The oil is skimmed from the surface, pumped to tankage and ultimately used for road surfacing or fuel oil. The acid layer is pumped to a neutralization tank equipped with a paddle stirrer and a recording pH meter. A water solution of pebbled lime is added until the pH of the solution is about 9.0. The batch is then dumped into a large lagoon. Spent acid not used to treat the soluble oil emulsion is pumped directly to the neutralization tank and treated in the manner just described.

(2) A plant which treats spent soluble oil emulsions separately by themselves successfully employs a combination of batchwise emulsion breaking and coagulation. Aluminum sulfate is added to the spent emulsion until the pH of the mixture is in the range of 3-4. The resulting mixture is then air blown until it is homogenous, after which caustic soda is added to a pH of 7-8. The alkaline mixture is allowed to stand and eventually separates into three layers. The bottom layer containing the floc and sludge is transferred to the city dump. The oil from the top layer is collected and sold to road surfacing contractors. The water layer contains 7 to 35 ppm. of oil and is satisfactory for inclusion in the sewage stream.

(3) Another plant treats 40,000 gallons per week of a 30:1 soluble oil emulsion. When the cleaning of a machine becomes necessary, the spent emulsion is transferred to the disposal plant which consists of two 10,000 gallon separating tanks, a 3,000 gallon oil storage tank, and two 400 gallon wooden chemical tanks. As the spent emulsion is brought to the disposal plant it is dumped into a shallow pit from which it runs down baffled stairways for settling out metal chips and proceeds to a sump inside the building housing the disposal facilities. The emulsion is pumped from the sump into one of the two separating tanks and calcium chloride solution from one of the chemical mixing tanks is added. Approximately 500 pounds of calcium chloride are added per 10,000

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Coolant Disposal . . .

gallons of emulsion. The mixture is heated to 190°F. by means of steam coils and allowed to stand. Aluminum sulfate solution from the other chemical mixing tank is then added. About 50 pounds of aluminum sulfate is used per 10,000 gallons of emulsion. The mixture is agitated by means of a circulating pump, after which it is allowed to cool and settle. Water pumped into the bottom of the tank causes the oil layer to overflow into a gutter on the inner circumference of the tank. This oil is subsequently transferred to the oil storage tank and is ultimately sold to road contractors or burned as furnace oil. The water layer is pumped to the plant sewage stream which discharges into a river.

(4) Still another company treats some 3,000 gallons per day of a 25-40:1 emulsion batchwise in two 1,000 gallon tanks having conical bottoms. Spent emulsion is put into the first tank and about one gallon 66°Be′ commercial grade sulfuric acid is added to reduce the pH. 25 pounds of aluminum sulfate are next added as a water solution and the contents of the tank are air blown until the mixture is homogenous. The mixture is then allowed to stand until a clean break is obtained between the oil and the water. This will usually require from 15 minutes to one hour. The oil is pumped to an oil storage tank and the water layer is pumped from the bottom of this tank into the second tank. Commercial sodium carbonate is added to the second tank until the pH is in the range of 7.5 to 8.0. This will require about 25 pounds of sodium carbonate. The mixture is then subjected to mild air agitation to obtain uniformity without disruption of the floc, and is then allowed to stand until the floc completely settles to the bottom. The floc is returned to the first tank, the water is dumped to sewage, and any oil on top is pumped to the oil storage tank. This oil is also sold to road contractors.

(5) The previous examples have dealt essentially with treatment of spent soluble oil emulsions only. This example will describe a most

efficient multi-step scheme for handling about 200,000 gallons per day of overall plant sewage containing other contaminants, in addition to soluble oil emulsions. The oil content of this sewage ranges from 2,000 to 4,000 ppm. Waste from various operations throughout the plant is collected in large sumps located at appropriate locations throughout the plant. The liquid is pumped from these sumps to a 120,000 gallon storage tank located on the roof of the building which contains the equipment used in the treatment of the waste. The holdup time in this tank is sufficient to allow separation of insoluble oils, such as lubricating oils and demulsified oil.

The waste is transferred from the holding tank to the bottom of the first mixing tank which is neoprene lined and is equipped with mechanical mixers. Aluminum sulfate is added until the pH of the mixture is about 3.5. The waste is in this first tank for approximately 10 minutes.

The partially broken emulsion from the first tank is next transferred to a neoprene lined settling tank where the holdup time is approximately two hours. The bottom of the tank is divided into four hopper sections, all sloping to the same side to permit easy removal of the moderate amount of sludge which is formed. The tank is also baffled to reduce turbulence and to give semi-quiescent conditions which will permit the small globules of oil to unite and form larger bodies which will rise to the surface. The separated oil is skimmed from the top and is transferred to the oil storage tank. The effluent from the separating tank is piped into the bottom of a caustic mixing tank where 10% caustic is added until the pH of the solution is about 8.0. This tank is also equipped with mechanical stirrers. The detention time in this caustic mixer is about five minutes, after which the solution is transferred to a large steel settling tank. This tank is equipped with a flocculation chamber, a sludge pit, and a settling chamber. Clarified water overflows into a trough and goes directly to the river. Any scum on the surface of the water is skimmed and transferred to the first mixing vessel. The

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settled sludge is pumped to a mixing tank located on a balcony slightly higher than all of the other equipment. Sulfuric acid is added with rapid agitation to transform the aluminum hydroxide back into aluminum sulfate. This acid aluminum sulfate solution is used as the emulsion breaker in the first mixing tank. The separated oil containing a large portion of water is treated with 66°Be′ sulfuric acid. The acid layer from this step is used to treat the above mentioned sludge. The oil is heated to 240°F. to remove final traces of water and is in suitable condition for use as a furnace oil.

It may be noted from the foregoing discussion that this particular plant has several unique features in comparison with other methods of treatment. First, although aluminum sulfate is used as an emulsion breaker, only a small amount of this chemical is consumed in the process because of the recovery system. A small amount of make-up aluminum sulfate is necessary, but the chemicals consumed in quantity are the less expensive sulfuric acid and caustic soda. Caustic soda was selected as the alkali in preference to lime to avoid formation of insoluble calcium salts (which would precipitate with the floc, build up within the system, and hence eventually become a disposal problem in themselves). Secondly, the system is so designed and operated that there are no by-products or additional disposal problems. Only legally clean sewage and useful furnace oil result from the process; no road oil, sludge, etc. must be sold or hauled away. Lastly, the hydraulics of construction are such that only a minimum number of pumps is required. The liquid flows by gravity from the storage tank and through all stages of the process, since there is a six to twelve inch drop in water level between each stage. A sludge pump is required to lift the sludge to the acid treatment tank on the balcony, but even the tanks for chemicals are on the balcony, so that they may gravitate to the process tanks.

SUMMARY

Disposal of industrial wastes has become a serious problem and currently is a matter of great concern. The day has long since passed when waste from industrial plants could arbitrarily be dumped into the normal sewage outlet or routed to the nearest stream or river. Now the nature and composition of such waste material discharged to public waterways are very carefully controlled by Federal, State, and in many instances, local laws and regulations. This means that, in many cases, each plant must treat its waste material so that it will conform to legal requirements. Since the type of waste will vary greatly from plant to plant, it is apparent that the problem is an individual one and there is no one standard treating procedure which could be employed successfully by all.

The problem is complicated further when the waste material includes spent soluble oil emulsions. Since oil is one of the ingredients of plant waste whose concentration must be controlled, these emulsions must be broken so that the oil component can be separated from the water. Several general schemes for accomplishing this have been discussed which can serve as guides to those confronted with this problem. • • •

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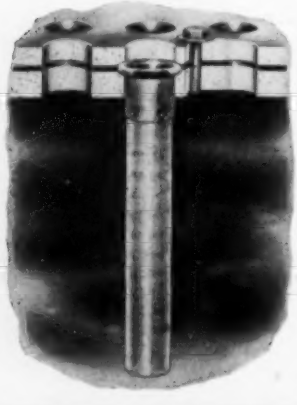

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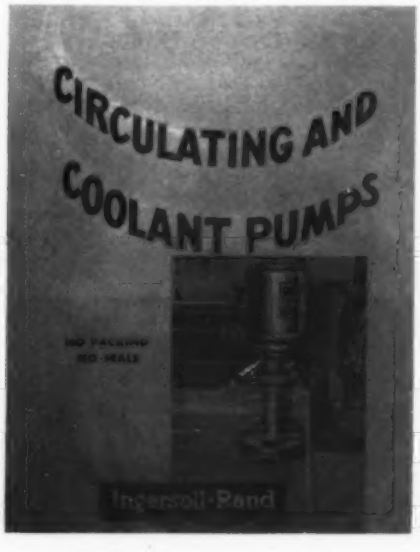

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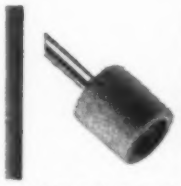

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Also described is the Model CBE-10 Electrolytic Chip Breaker Grinder for 10″ diamond wheels. The unit is also available for 6″ diamond wheels (Model CBE-6).

The advantages of electrolytic grinding, with increased stock removal and reduction of diamond consumption, are also explained.

Hammond Machinery Builders, Inc., 1651 Douglas Avenue, Kalamazoo, Mich.

Use postpaid card. Circle No. 13

Liquid Coolant Chillers

Coolant chillers for industrial installations are described in a folder from Lundholm Mfg. Co. The fully automatic self-contained units are available in several capacities depending on the amount of heat that must be dissipated in the operation. These units have been successfully installed on many grinding jobs for increased production, better wheel life and finish, and a saving in wheel dressing. Large coolant reservoirs can be eliminated by using the devices, where floor space is at a premium.

Lundholm Mfg. Co., 1121 Charles St., Rockford, Ill.

Use postpaid card. Circle No. 14

Hand Feed Surface Grinder

Bulletin 177 describes new Covel No. 17, 10″x16″ hand feed surface Grinder. Elevating handwheel is located below table level, so point of wheel contact and hand wheel graduations are in operator's field of vision. Hard Chrome table ways are featured, said to eliminate periodic hand scraping. Timing belt drive actuates table. Precision ball-bearing spindle is grease lubricated cartridge type, sealed for life.

Covel Mfg. Co., Benton Harbor, Mich.

Use postpaid card. Circle No. 15

REPORT FROM THE ASSISTANT CHIEF ENGINEER,
THE TIMKEN ROLLER BEARING COMPANY, COLUMBUS...

"We process 4,000 lbs. of rollers in one load with ALMCO barrel finishing equipment"

MR. FRED ALBRIGHT, Assistant Chief Engineer, The Timken Roller Bearing Company, Columbus, displays rollers processed in two-ton batches by rugged Almco equipment.

AT COLUMBUS, OHIO, the Timken Company runs three shifts on rollers in a range of sizes. After heat treating and oil removal, rollers go to the Almco barrel section for cleaning-up of insert identification, radius polishing, and coloring.

Prior to this the Timken Company used other equipment, but it turned out to be a bottleneck that took up too much space. Maintenance costs were high, and its messy operation did not conform to the Company's high standards of plant housekeeping.

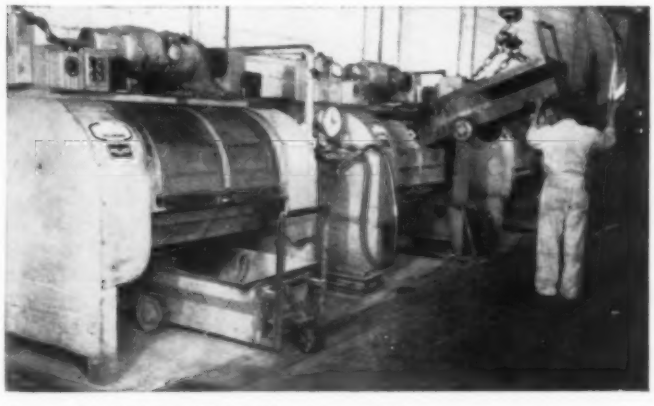
ALMCO SYSTEM REQUIRED 50% LESS FLOOR AREA — In cooperation with Timken Company engineers, Almco designed specially engineered heavy duty equipment for their system that raised output to production requirements . . . replaced the older equipment with a clean, controlled operation . . . and reduced floor area requirements by more than 50%.

BARRELS RE-LINED ONLY ONCE IN 2 YEARS! — These heavy-duty Timken tapered roller bearing equipped Almco machines and drive systems handle maximum loads at the Timken Company. Each two-compartment machine holds 16 pan-loads of rollers at an approximate weight of 250 lbs. per pan. This adds up to TWO TONS of rollers processed during each cycle!

It calls for equipment that will stand up under a punishing, round-the-clock production schedule. In this highly abrasive operation, Almco barrels at the Timken Company have been re-lined only *once* in two years!

LEARN HOW MODERN BARREL FINISHING CAN IMPROVE YOUR PRODUCT — The facilities of Almco's new, technician-staffed lab in Albert Lea, Minnesota are available to you without obligation. We will study your product parts, run exhaustive tests, and give you a factual report on the equipment and procedures best for your operation.

If you are interested in improving product quality and appearance, saving manpower and reducing your deburring and finishing costs, send your sample parts and specifications to the Almco lab. Or write on your company letterhead requesting an Almco engineer to visit your plant.



Cooperation between Timken Company and Almco engineers has resulted in efficient Almco installations in other Timken Company plants. The Timken Company at this time has a total of twelve DB-400 units and a DB-50. Minimum space is required for high-volume production . . . plant floor stays clean and safe.

SEND FOR YOUR FREE HANDBOOK OF BARREL FINISHING

52 pages of case history facts and barrel finishing processes. Illustrated equipment section. Includes detailed cost chart on finishing of typical parts. Send for your free copy today.

ALMCO

DIVISION OF QUEEN STOVE WORKS, INC.
137 Marshall Street • Albert Lea, Minnesota

Sales Engineering Offices in Chicago, Detroit, Los Angeles, Newark, New Haven, Philadelphia and London, England.

Use postpaid card. Circle No. 231

Centrifugal Collectors

A new, fully-illustrated folder on centrifugal collectors is now available from The Kirk & Blum Mfg. Co. It describes in detail two new-design types, and explains range of industrial applications for each in efficient air cleaning and dust collection through centrifugal force. Complete specifications for the 41 sizes of Kirk & Blum centrifugal collectors are included, as well as dimensional drawings. Information on collector selection through determination of particle size, etc., is presented.

The Kirk & Blum Manufacturing Company, 3120 Forrer Street, Cincinnati 9, Ohio.

Use postpaid card. Circle No. 16

Blast Unit Liners

"Wear-Resist" liners for better protection of blast cleaner parts subject to abrasive action are described in a new bulletin issued by Pangborn Corporation. Bulletin No. 332-B contains application information and specification data for both Rotoblast wheels and the Pangborn Blastmaster. Bulletin gives complete information on two new "Wear-Resist" alloys, available for wheel housings, drum heads and other blast-cleaner parts. Wear-test data is included as well as hardness and increased service life figures. Drawings illustrate how the use of abrasive resistant end plate liners can effect an overall savings in material costs as well as a reduction in installation, labor and increased production because of reduced downtime.

Pangborn Corporation, Hagerstown, Md.

Use postpaid card. Circle No. 17

Hose

40-page Hose, Hose Ends and Assemblies catalog is announced by The Weatherhead Company, Fort Wayne, Ind.

Catalog gives complete information on bulk industrial hose, permanently attached hose assemblies, swaged hose assemblies and ends, hose end swivel adapters, assembly instructions and installation data. Over 180 elements are shown, in easy-to-read form, on the Agent Selector Chart. Resistance ratings of Butyl, Buna-N, Neoprene, Teflon and other Synthetic Compounds are identified with specific Weatherhead hoses.

The Weatherhead Co., 128 W. Washington Blvd., Ft. Wayne, Ind.

Use postpaid card. Circle No. 18

Work Positioners

Advantages of AMF Lowerator self-leveling work positioners in solving material positioning and handling problems are graphically demonstrated in folder. The top layer of material on the platform is kept always at the correct working/dispensing level, whether the unit is full, half-full or nearly empty. Specifications of all types and models, including dimensions and capacities, are included.

Lowerator Div., American Machine & Foundry Co., AMF Bldg., 261 Madison Ave., New York 16, N.Y.

Use postpaid card. Circle No. 19

Wet Blasting

"Wet Blast Cleaning and Finishing News," periodical of Wheelabrator Corporation, discusses and illustrates many applications of wet blasting in both metal cleaning and finishing operations. Models of the Liquamatte wet blast machine are adaptable for either single piece or batch cleaning and finishing. Although the most commonly used wet blast abrasive is a silica-type slurry, many other abrasives are available for special applications. Wet blasting applications include preparation of metal parts for plating, finishing, reconditioning, inspection, tool and die conditioning, and mold and die cleaning.

Wheelabrator Corp., 1169 S. Byrkit St., Mishawaka, Ind.

Use postpaid card. Circle No. 20

FOR High Speed CUTTING
TO AMAZING TOLERANCES
. . . The TY-SA-MAN 122-C
IF YOU CUT . . .
ALUMINUM
MAGNESIUM
TITANIUM
STEEL
IRON
COPPER
GRATING
PLATE
STRUCTURALS
STAINLESS STEEL
There's a Ty-Sa-Man Saw to Meet Your Needs
Cut Your Inventory By Cutting Your Own Metal
Stock big sizes and cut it as you need it . . . that's the success story behind the Ty-Sa-Man saws that are paying big dividends to warehouses, fabricators and manufacturers from coast to coast. Best of all, when you cut it, in most cases, it's ready to use. The clean, square, accurate edges produced by this production saw need little or no machining or finishing work. This adds up to a saving of thousands of man hours, and just as important, saves the loss of waste metal.
Write For Free Catalog
Ty-Sa-Man
MACHINE COMPANY
1016 WHITE AVENUE, KNOXVILLE, TENNESSEE

Use postpaid card. Circle No. 232

Drum Agitator

Data Sheet No. 2 outlines technical features of a drum agitator and describes the simple procedure for mounting in the threaded bung of a standard 55-gallon drum. Also included is a discussion of why drum agitation is necessary. Reference chart shows recommended agitation time for the full range of specific gravities encountered in liquid chemical mixtures.

Prenco Products, Inc., 507 E. 10 Mile Rd., Hazel Park, Mich.

Use postpaid card. Circle No. 21

Small Air Grinders

New 1170 Series air powered small wheel grinders are featured in Bulletin 59, offered by Rotor Tool Co. Several spindle combinations, collets, arbors and throttles are available on the line of tools. Featured in the basic construction are balanced centrifugal governor, built-in air strainer, pregreased special select ball bearings and solid, one-piece spindle.

Rotor Tool Co., 26300 Lakeland Blvd., Cleveland 32, Ohio.

Use postpaid card. Circle No. 22

Wet Hone Machines

"Blast with Clemco Wet Hone Machines" describes line of wet hone machines and rooms manufactured by Clementina Ltd. In wet honing, waterborne abrasives to polish or finish surfaces. Some applications: oxide removal, tool finishing, die and mold finishing, deburring, cleaning, surface preparation prior to plating.

Clementina Ltd., 2277 Jerrold Ave., San Francisco, Calif.

Use postpaid card. Circle No. 23

Barrel Finishing

21 cost saving studies are featured in 12-page booklet being offered by Minnesota Mining and Manufacturing. "Honite" method of barrel finishing is covered in detail, showing typical savings over previous methods. Actual before-and-after pictures of parts, as well as charts indexing types of barrel finishing media and compounds, are included.

3M Company, Dept. F7-113, 900 Bush St., St. Paul 6, Minn.

Use postpaid card. Circle No. 24

Jig And Fixture Details

Harco Engineering announces a new 82 page jig and fixture detail catalog for tool designers.

Full scale templates of all Harco products are assembled in loose leaf form to simplify removal for detailing and tracing. Products included are: Fixture clamps, fixture keys, cams, screws, nuts, washers handles, hand knobs and hand wheels.

Harco Engineering, 12092 Woodbine Ave., Detroit 39, Mich.

Use postpaid card. Circle No. 25

Mold Bases

Six new sizes of DME standard mold bases (up to 23¾" x 35½") are presented in 12-page bulletin. Clamp slots save platen space, eliminate clamping ledges. More room for waterlines—tubular dowels eliminate obstruction. Stop pins are welded to ejector bar, preventing loosening and ejection interference. New widths fit more molding machines, allow more cavities to existing platen area.

Detroit Mold Engineering Co., 6686 E. McNichols Rd., Detroit 12, Mich.

Use postpaid card. Circle No. 26

All-Purpose Diamond Compound

Bulletin describing and pricing diamond compounds is offered by The Amplex Corporation, manufacturers and distributors of industrial diamond products. Listed are grades from ½ to 170 micron range in a variety of concentrations; also "WC" diamond compound for finishing tungsten carbide, heavy concentration only. All grades certified to be in accordance with U.S. Bureau of Standards specifications.

The Amplex Corp., 968 Farmington Ave., West Hartford, Conn.

Use postpaid card. Circle No. 27

Deburring

Deburring and finishing cast, machined and stamped parts by barrel finishing are discussed in a four page brochure "Scratching the Surface." Illustrated information is furnished on types of fixturing, shop hints for cutting tumbling costs, new methods of deburring and high velocity finishing through the use of the "Reciprotron," a new type finishing machine that does not tumble.

Metal Parts Sales Co., 165 Delancey St., Newark, N.J.

Use postpaid card. Circle No. 28

For increased production . . .

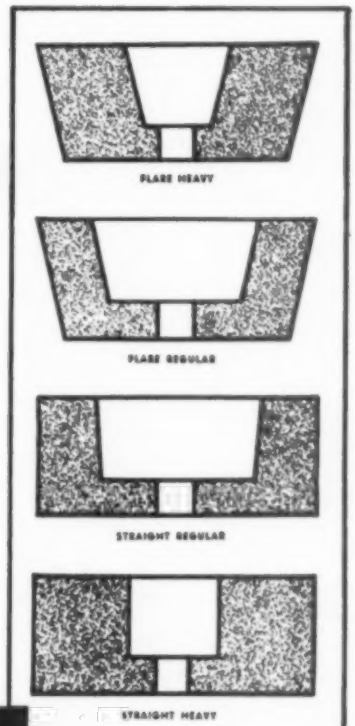
ATLANTIC

"Job-Mated"

GRINDING WHEELS

A manufacturer of marine propellers raised finishing output 15% with the use of ATLANTIC "Job-Mated" GRINDING WHEELS. Closely-mated wheel characteristics with job requirements were credited as the main factors in making this increase possible. ATLANTIC representatives work on the basis that every grinding operation should be engineered for best results.

ATLANTIC Resinoid-Bonded CUP WHEELS are available in all popular shapes, sizes, grits and grades. Their wider lip design increases wheel life without sacrificing fast cutting qualities. Investigate their production possibilities. Consult your ATLANTIC ABRASIVE representative, or write direct to ATLANTIC ABRASIVE CORPORATION, 532 Pearl St., South Braintree 85, Mass.



For maximum safety, all ATLANTIC CUP WHEELS from 2½" up are speed-tested at a 50% higher speed than normally required.

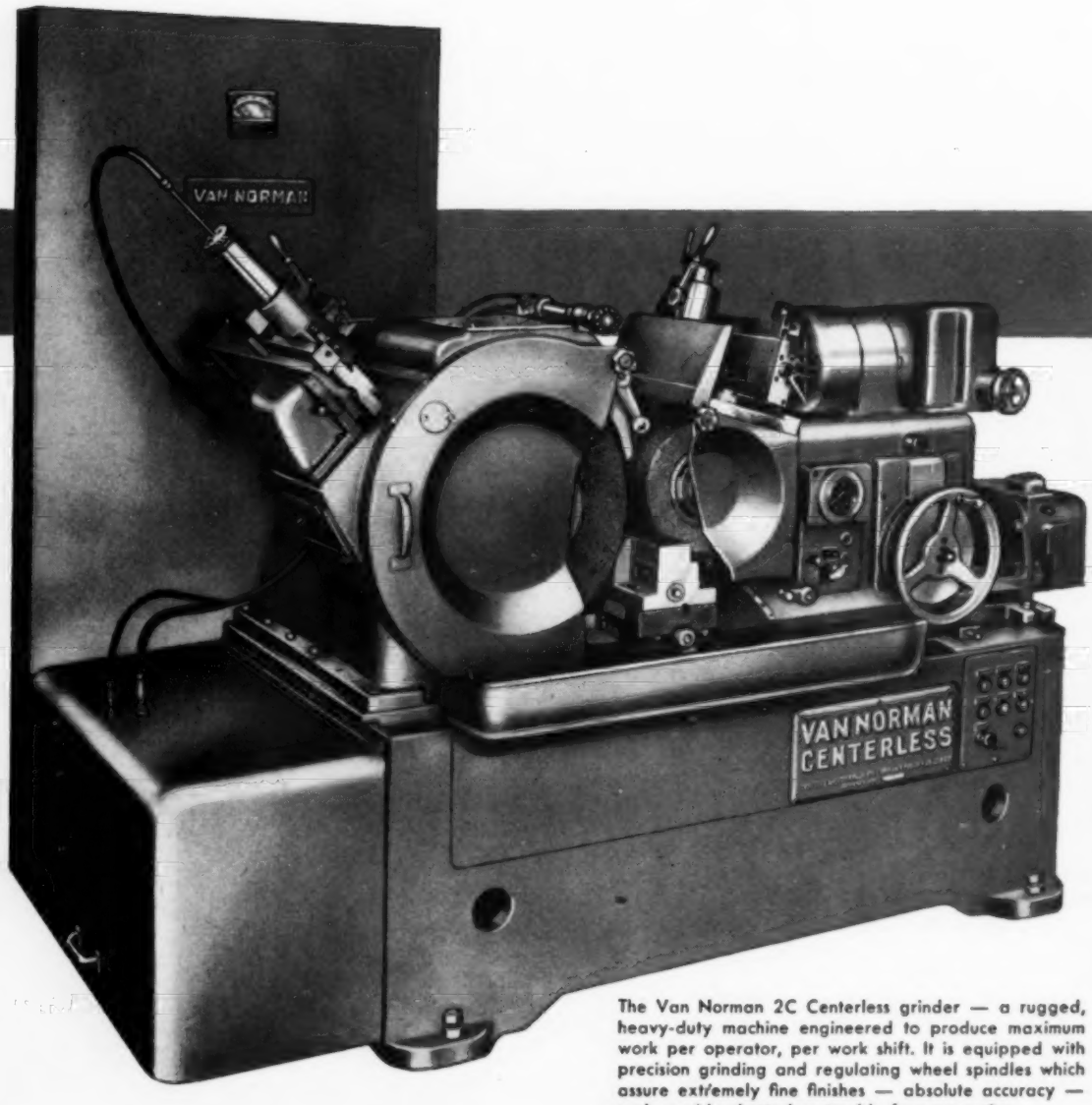
ATLANTIC ABRASIVE CORP.

South Braintree 85, Massachusetts

Use postpaid card. Circle No. 233

VAN NORMAN

Centerless



The Van Norman 2C Centerless grinder — a rugged, heavy-duty machine engineered to produce maximum work per operator, per work shift. It is equipped with precision grinding and regulating wheel spindles which assure extremely fine finishes — absolute accuracy — and provide chatterless trouble-free operation.

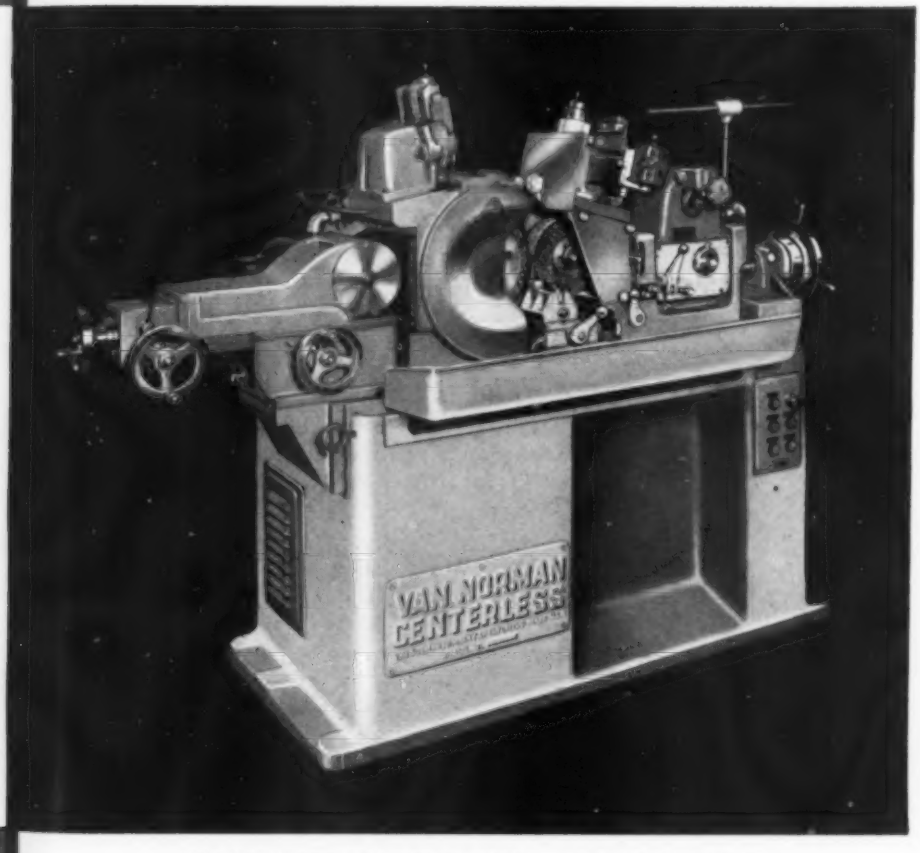
VAN NORMAN MACHINE

a division of Van Norman Industries, Inc.

MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

Grinders

Precision Grind Parts Fast, Economically, To Close Tolerances



The Van Norman 1C Centerless grinder — finish grinds some small parts from solid . . . or finish grinds rough-turned parts. The 1C is especially suited for grinding parts used in business and office machines, sewing machines, electrical appliances, aircraft, automobiles, munitions and similar work.

Van Norman Centerless grinders are precision-manufactured to produce a wide variety of parts made of metal, wood, fibre, plastic or glass. Actually these Van Norman Centerless grinders are three machines in one . . . will handle thru-feed work, in-feed work and — equipped with a Crush Dressing Attachment — form grinding and profile work. Get complete details on the Van Norman 1C and 2C Centerless grinders. Write, wire or telephone for catalog.

COMPANY
SPRINGFIELD 7, MASSACHUSETTS

Don't wait . . . for extra profit install a Van Norman machine now! They are available in many purchase plans . . . Outright sale . . . Purchase on conditional sales contract up to five years . . . Pay as you depreciate up to 10 years.

Use postpaid card. Circle No. 234

Grinding and Finishing

New Equipment and Materials

For further information on any of the products listed here, use the handy postpaid card opposite page 100.

Diamond Collector Recovers 30% of Carats

A new diamond collector designed and manufactured by Torit Mfg. Co. is making diamond "mining" in the machine shop and tool room a profitable undertaking.

The new collector is designed for installation in either a central collecting system or with unit-type systems and is adaptable to any type of diamond-wheel grinding, whether mist, wick or dry grinding. In recent controlled tests by a large automotive manufacturer, the diamond-bearing dust, or swarf, collected by Torit diamond collectors was found to be many times richer in diamond bort than that trapped by conventional collectors. An average of 30 per cent of the carats originally contained in the grinding wheels was recovered from the swarf caught by the Torit units. The wheels were of various sizes commonly used in industry.

Shop officials estimated that the units paid for themselves in only 21 operating days in salvaged swarf that is resold for reclamation, and the tests demonstrated that $100 can be recovered for every $1,000 invested in diamond wheels. The collector, it was pointed out, costs no more than a single diamond wheel.

The new diamond collector operates on a centrifugal separating principle that eliminates filters entirely and permits a compact, low-price design. It deposits the diamond-bearing dust in a clear Plexiglas container where it can be visually inspected. When full, the top can be unscrewed and the container easily emptied. No other maintenance is necessary.

Its compact design (the collector plus power unit weighs 65 pounds) allows it to be mounted directly on machinery, on walls, overhead beams or on a specially-designed table available with the collector. When mounted on the table, it occupies only 14" x 22" of floor space.

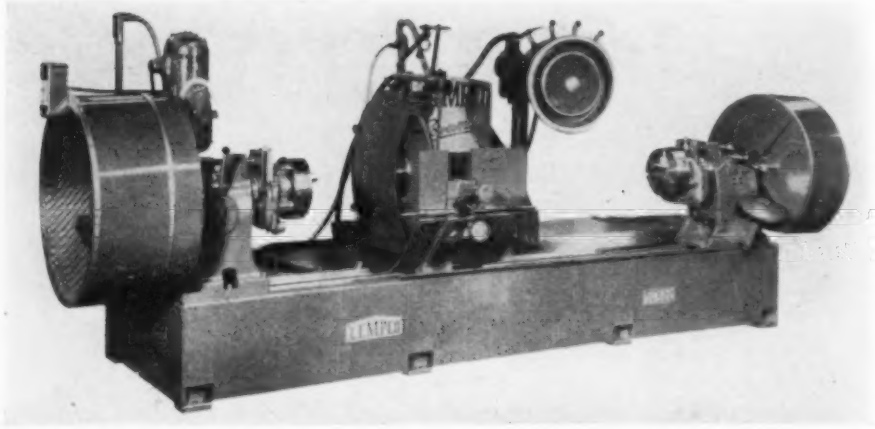
Because it is impractical to reclaim diamond dust that has been contaminated with residue from other type grinding wheels, the Torit unit is equipped with a by-pass valve. This allows grinding wheels of other types to be intermittently used on the same grinder without danger of contaminating the collected diamond dust.

The Torit collector is powered by a ½ hp, 3450 rpm motor, either 110V/60 cycle, 1 phase, or 220-440V/60 cycle, 3 phase and is available with other electrical characteristics.

Price of the complete collector unit, including flexible hoses, by-pass valve and connections, equipped with the 220/440V power unit, is $198.50 F.O.B. factory.

Torit Mfg. Co., Walnut and Exchange Sts., St. Paul 2, Minn. •

Use postpaid card. Circle No. 102



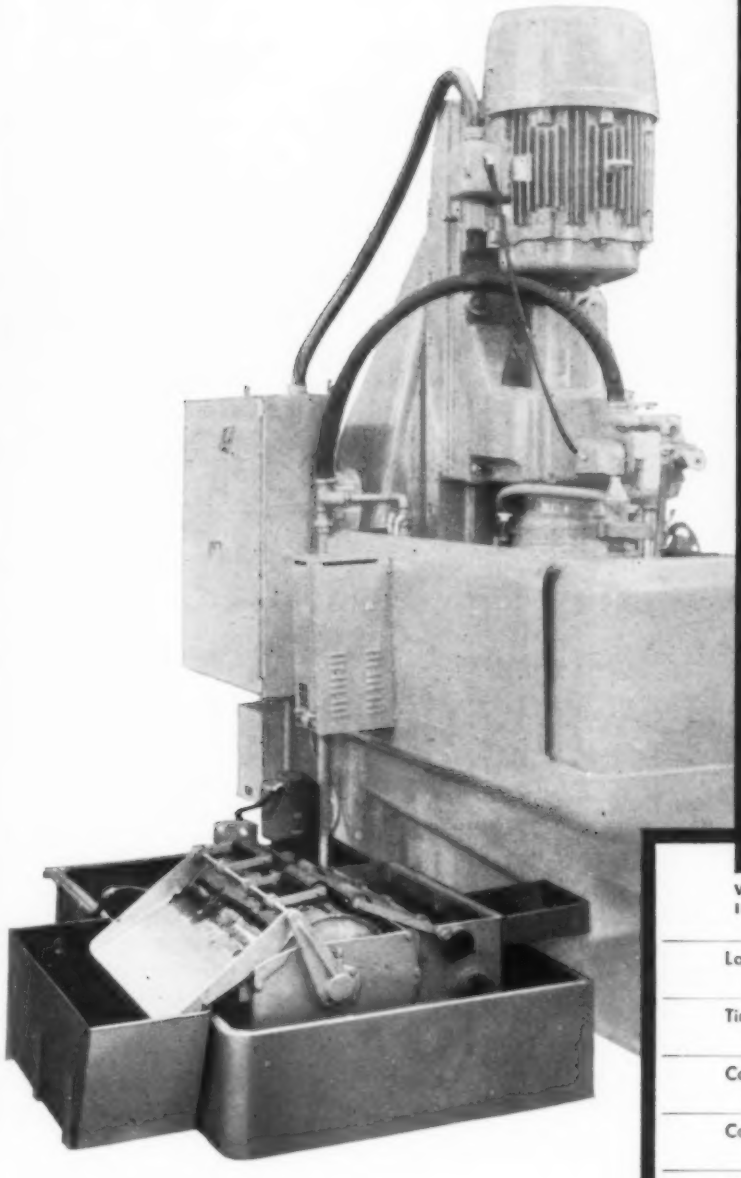
CRANKSHAFT GRINDER—Lempco Model 520 Powermatic crankshaft grinder offers more operating and design features for regrinding both small and large crankshafts. Among the 520's new features: completely power operated with five separate motors, including workhead motor with infinite vari-drive selection. All controls centralized on one panel. Swing 26", length capacity 86", stroke 10". Standard equipment: 360° graduated type throwheads with 10" diameter chucks, electromagnetic crankshaft balance meter, outboard counter balancing, pressurized spindle bearing lubrication, Timken tapered bearings throughout. Lempco Products, Inc., Bedford, Ohio.

Use postpaid card. Circle No. 101

BARNESDRIL

magnetic separator saves $152.50 weekly

...on grinding operations



An Eastern manufacturer installed a Barnesdril Magnetic Separator on a Hanchett Grinder. After the separator had been in operation approximately a year, they compared grinding costs against the costs previous to the separator installation. These figures showed a weekly savings of $152.50.* The installation cost was returned in savings in less than 6 weeks.

All coolant from the grinder continuously recirculates around the drum of powerful permanent Alinco Magnets in the separator. Swarf, chips, and other ferrous particles are removed resulting in the decreased grinding costs shown. Not shown, but important factors are, the decrease of dermatitis and improved finish of ground parts.

For complete information about Barnesdril Magnetic Separators, call your Barnesdril Representative or write for Bulletin No. 300D.

*

WEEKLY COST COMPARISON BEFORE AND AFTER INSTALLING A BARNESDRIL MAGNETIC SEPARATOR

	Before	After
Labor Consumed Cleaning Coolant System @ $1.00 per hr.	$ 12.00	$ 2.00
Time Lost by Machine Operator @ $1.50 per hr.	18.00	3.00
Coolant Compound Used @ $1.50 per gal.	21.00	4.50
Cost of Wheel prorated weekly	37.50	26.50
Machine downtime @ $10.00 per hr.	120.00	20.00
Totals	$208.50	$56.00
Total Weekly Savings	**$152.50**	

50th year

BARNES DRILL CO.

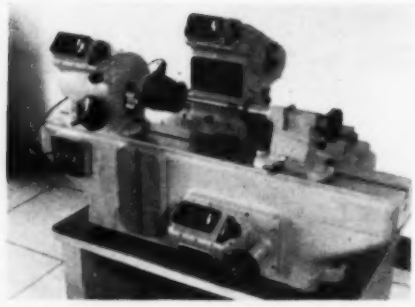
886 CHESTNUT STREET • ROCKFORD, ILLINOIS
DETROIT OFFICE: 3419 South Telegraph Road

Use postpaid card. Circle No. 235

Universal Optical Measuring Machine Inspects 3-Dimensional Cams

The Alexander Universal Optical Measuring Machine (See G & F, August 1956, p. 38) for checking contours of 3-dimensional cams to tolerances as close as .00005″ is now available in the United States. This machine records rectangular coordinate dimensions and controlled rotary movements simultaneously—and is also adaptable for the checking of gears, threads, length measures and gap gauges. It is sold in this country by J. Arthur Deakin & Son.

The measuring stylus is mounted on a floating ram which is supported on 10 precision ball races and spring-loaded to maintain constant pressure on the work. Forward movement of the ram may be limited and measuring pressure is adjustable. The ram, moving traversely, carries a glass scale marked in .05″ divisions which are projected to vernier graduations on a screen reading to .005″. Final readings are taken from an optical micrometer graduated to .00005″. The stylus head ram is mounted on a carriage which also moves on precision ball races along a longitudinal slide. An optical projection system, positioned on the front of the machine and similar to that of the stylus ram, provides screen readings of longitudinal increments. A three-position lever on the side of the ram head permits free movement along the slide, controlled movement by means of a handwheel, or stationary, locked position.

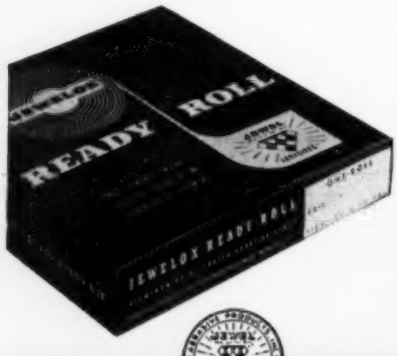


Optical measuring machine for cam inspection.

The third measuring element is a standard Alexander P. G. Optical Dividing Head located in front of the ram head and parallel to the head slide. Angle of rotation may be read to 0.1 minute on a projection screen. Alternate locating of the dividing head to the front of the machine permits measuring of flat cam profiles by an extended stylus.

To measure the pitch of threads, gap gauges and length bars, and the steep slopes of cams, a stylus head allowing a limited lateral float to the stylus is available. This movement is indicated on a .0001″ dial comparator. Five interchangeable ball styli, ¼″, ⅜″, ½″, ⅝″ and ¾″ are supplied as standard. •

Use postpaid card. Circle No. 103



At your finger tips for metal working jobs . . . fifty yards of super-keen abrasive cloth tightly wound on a metal spool, full 1″ arbor . . . in widths of ½″, ¾″, 1″, 1¼″, 1½″, and 2″ . . . all standard grain sizes from 24 to 400.

Hang up in convenient spot, yet out of the way . . . always ready for immediate use. Simply tear off strip of desired length. Popular for grinding, finishing, polishing hard to reach places . . . also for short jobs or odd jobs.

JEWELOX abrasive grains are sharp and tough. Its specially woven cloth backing is processed for extra strength. Each roll packed in strong, attractive carton. 10 ready-rolls to a standard shipping unit. For complete details write Abrasive Products, 517 Pearl Street, South Braintree 85, Mass.

Abrasive Products, Inc.

Use postpaid card. Circle No. 236

Cover Goggle

Watchemoket Optical Model No. 44OM is designed for those who need a smaller size all-purpose cover goggle. Wide angle lens fits over most prescription glasses and is wide enough across the brow to accommodate glasses with even higher than average temples. Soft vinyl frame form-fits any face; actually hugs the contours and closes all gaps against eye hazards. Flanged nose bridge gives added protection around the nose. Frame comes in clear, green or opaque black vinyl. The lens is available in either methacrylate for heavy-impact protection or acetate for average impact protection. Model 44OM offers a choice of regular, screen or the new fog-free Stac-Vent ventilation.

Watchemoket Optical Co., Inc., 232 West Exchange St., Providence 3, R.I. •

Use postpaid card. Circle No. 104

Medium-size all-purpose cover goggle.

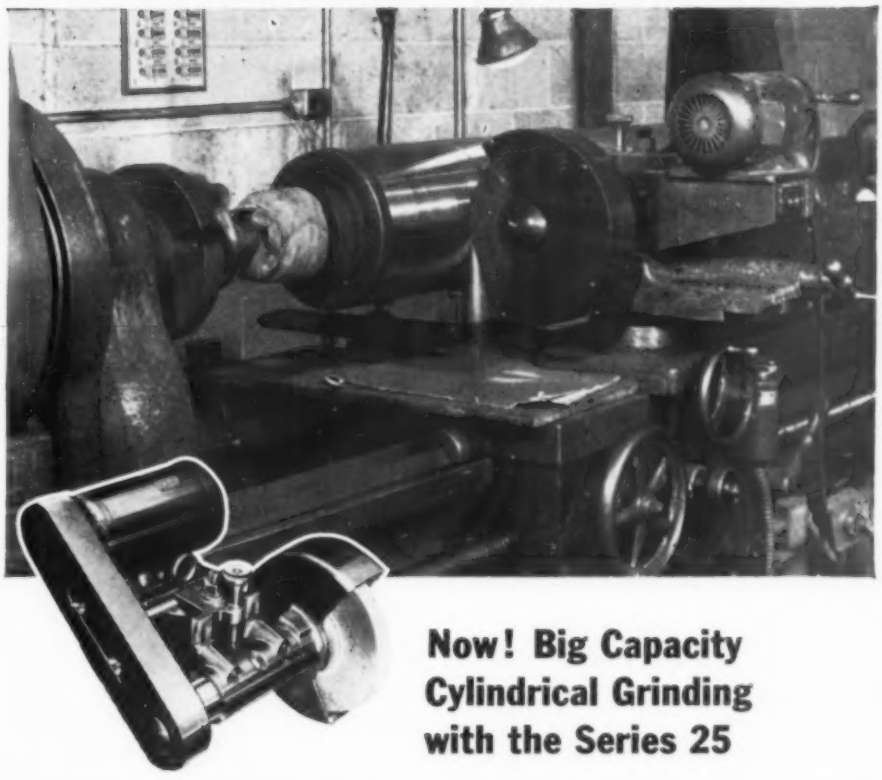
Hand Grinder Speeds Gear Finishing

Making gears of all sizes and shapes is one phase of the business of the Wisconsin Axle Division of Timken-Detroit Axle Co. During manufacture, burrs occur which must be removed for precision gear performance.

This is a painstaking, exacting job which can only be done by hand work. The tool used must have the ability to reach into every nook and tiny corner of the gears. It must be reasonably light in weight, easy-to-handle and have sufficient sustaining power to enable it to be used at day-long intervals, if necessary. Cool operation must also be provided for. Versatility in wheel capacity is another requirement. In short, the tool used should be designed and engineered to provide flexibility in use with a reasonably long life expectancy without excessive maintenance.

To meet these strict requirements, the workmen are equipped with Dumore Hand Grinders. They use these grinders to deburr not only the gears shown, but every big and little gear made by the company. These grinders have repeatedly proved their ability to provide this manufacturer with an efficient, low-cost deburring operation.

The particular hand grinder used is the Dumore Series 10 model. It is recommended for burring, as well as tool and die work, pattern making, production bench grinding, filing and a host of other work. Positive spindle rigidity, forced cooling and quick-change chuck. Universal motor, idles at 22,000 rpm. For further information on this and other Dumore Hand Grinders for high precision grinding at low cost, write to The Dumore Company, 1326 Seventeenth Street, Racine, Wisconsin.



Now! Big Capacity Cylindrical Grinding with the Series 25

DUMORE TOOL POST GRINDER

MOUNTED ON THE COMPOUND . . . of a 20" lathe . . . the Series 25 Dumore Tool Post Grinder provides Bird & Son, Charleston, So. Carolina, with an extremely low cost precision cylindrical grinder for refinishing large rollers.

Grinding is necessary to maintain an extremely smooth finish on big steel rollers required in production operations. Formerly, the work was farmed out to the only available supplier. However, lengthy work scheduling by this single source, transportation time delays, and high costs, proved unsatisfactory.

With the Series 25 Dumore Tool Post Grinder mounted on a 20" lathe, these 12" diameter, 60" long rollers are finish ground regularly in their own plant in one eight-hour day, including loading and unloading. This easily obtained, low-cost, precision grinding equipment has now given Bird & Son the advantages of minimum production delays and lower maintenance costs.

With a 3 hp., 3-phase induction type motor, the Series 25 Dumore Tool Post Grinder is the ideal tool for heavy grinding. 12" wheel capacity. Efficiently hogs away metal or finish grinds. Rugged cast-iron frame assures rigid vibration-free performance. Quill has grease-sealed, lubricated-for-life, precision roller bearings for operation in any position without special oilers. Special patented sealing rings protect bearings during wet or dry grinding.

MOUNTS ON *ANY BASIC* MACHINE TOOL . . . 20" or larger lathes, planers, shapers, boring mills . . . to provide precision grinding equipment at low cost. Simplified mounting makes change-over quickly.

WARNING: If you own a Dumore Tool Post Grinder — don't let it sit idle in your tool crib! It's the most versatile, useful tool you own. Put it to work **NOW** — you'll save money and get better results!

Tool post grinders are available in other sizes to use on smaller machines for every type of job. Ratings range from 1/4 to 1 hp. For complete details write for Full Line Catalog 55 FL.

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

You can do more grinding with Dumore Grinders on **any** machine tool!

DUMORE® PRECISION TOOLS

AUTOMATIC DRILL UNITS
TOOL POST and
HAND GRINDERS

1326 Seventeenth Street, Racine, Wisconsin

Use postpaid card. Circle No. 237

Low Cost Tumbling of Small Parts

An electric-powered tilting drum mixer costing less than $400, originally designed for mixing concrete, proved ideally adapted for low cost tumbling of small brass and stainless steel parts for Harper Manufacturing Co., Maumee, O. Not only does the mixer cost less than conventional machines designed for this type of work, it has a larger capacity. Its 7 cu. ft. drum cleans, smooths and polishes 500-lb. lots of lock washers, snap rings, 0 rings, C rings, etc., and discharges them into containers, ready for shipping. Finely ground corncobs are put in the drum to speed cleaning and polishing by absorbing the oil film present on the parts. Drum is coated with automobile undercoating material to reduce noise to a minimum.

Speed King concrete mixer finishes small parts.

Speed King Mfg. Co., Division of The Jaeger Machine Co., Columbus 16, O. •

Use postpaid card. Circle No. 105

Automatic Self-Cleaning Filter

Dual purpose fully automatic filter with interchangeable filter elements is available from Bowser, Inc.

The new filter, when equipped with filter elements designed for lubricating oils and similar liquids, is known as Figure 822. When containing filter elements suited to coolants, it is known as Figure 823. Both types of elements are interchangeable within the filter case.

The filter media of the Figure 822 (for lubricating oils) is constructed of wire-wound stainless steel or bronze wrapped around a cast iron core, with a port opening range of .002 to .015. Figure 823 (for coolants) offers a porosity range of .020 to .045, utilizing a brass perforated sheet as filter media.

An interval repeat timer provides completely automatic self-cleaning and permits adjusting the length of the cleaning cycle from a minimum 20 seconds to a maximum 30-minute period.

Bowser, Inc., Lubrication and Filtration Div., 1300 E. Creighton Ave., Ft. Wayne, Ind. •

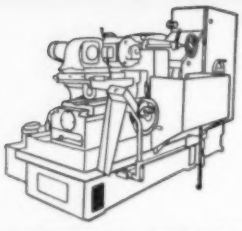
Use postpaid card. Circle No. 106

Production

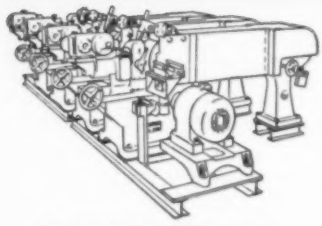
CENTERLESS GRINDING & FINISHING MACHINES

THERE'S A PRODUCTION MACHINE FOR EVERY PURPOSE

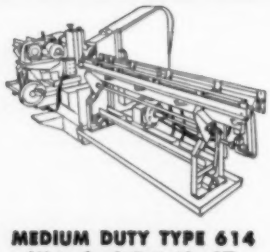
- ★ Heavy stock removal on Bars and Tubes
- ★ As low as 5 micro inch RMS surface finishes
- ★ Traverse direction reversible
- ★ Any diameter — any length
- ★ Production rates unlimited
- ★ Single or Tandem installations
- ★ Traverse speeds up to 100 FPM
- ★ Plunge cut or thru-feed
- ★ Shoulder Work, formed parts



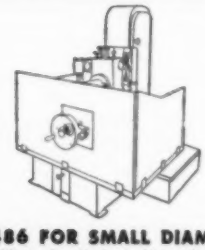
HEAVY DUTY TYPE 914
Write for Bulletin No. 14



HIGH SPEED TYPE 101
Write for Bulletin No. 16



MEDIUM DUTY TYPE 614
Write for Bulletin No. 17



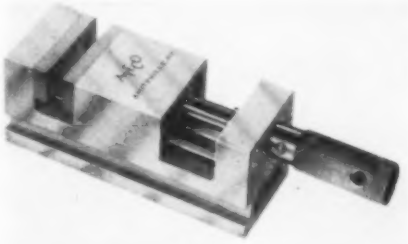
TYPE 486 FOR SMALL DIAMETERS
Write for Bulletin No. 19

PRODUCTION MACHINE CO. Greenfield, Mass., U.S.A.

Use postpaid card. Circle No. 238

Toolmaker's Vise

A new toolmaker's vise, precision ground on all external surfaces to an accuracy of .0004" per inch, has been introduced by Air Transport Equipment, Inc.

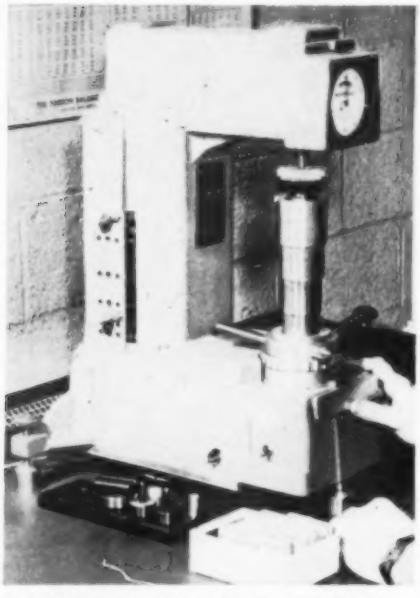


All parts except a totally enclosed leadscrew are hardened, and the leadscrew, operated by a knurled handle or bar, is equipped with a dustproof means of oiling. A groove all around the base of the new vise provides means of clamping it to machine tables, etc. and a dovetailed slide, adjustable for wear, has been incorporated to give rigidity and parallel location of jaws under all circumstances.

In three models, the smallest Ateco precision toolmaker's vise has a jaw width of 1-1/4", depth of 7/16", jaw opening of 1", and weighs 1¼ lbs. The largest size has a jaw width of 2½" and the in-between model 1⅞", other dimensions being in proportion. Prices start at $24.50.

Air Transport Equipment, Inc., Amityville, N.Y. •

Use postpaid card. Circle No. 107



MOTORIZED HARDNESS TESTERS— Two new Kentrall motorized combination hardness testers have been announced by Torsion Balance Co., Clifton, N.J. Available as standard models in 8" and 12" vertical capacity, they reduce operator fatigue by motorization of the major load.

Use postpaid card. Circle No. 108

Lighted Switch Serves Dual Purpose

A new dual-purpose, lock-down switch has been added to the expanding line of illuminated push-button switches being marketed by Micro Switch, a division of Minneapolis-Honeywell Regulator Company, Freeport, Ill.

The new lighted switch functions as a conventional pushbutton type when pushed straight down. When pushed and turned approximately 20 degrees clockwise the switch is maintained in the operated position. When turned counter clockwise from this position, the switch pops up to unoperated position.

In many applications, the company points out, this feature will allow the switch to function as two switches in one. The switch, designated 52PB7-T2, can take the place of an alternate-action pushbutton and also provide optional momentary action.

These features suggest many applications in which the user can save on the cost of panel space, relays, indicator lights, wiring and power, as well as on the cost of the switch itself.

A new subminiature bulb, independent of the switch circuit, illuminates the switch's translucent button, offering the compactness of built-in indication. The position of the button, locked down or unoperated, gives additional indication.

Two precision subminiature basic switches, actuated by positive over-center snap-action, provide exceptionally reliable operation. The switches are listed by Underwriters' Laboratories at 5 amperes 125 or 250 volts ac. •

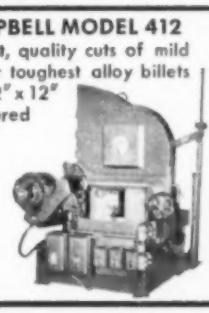
Use postpaid card. Circle No. 109

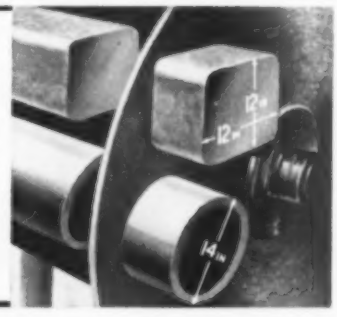
Campbell
Abrasive Cutting Machines

Abrasive Cutting Know-How

Know-How is just as vital to top performance in abrasive cutting as in any other machine tool operation

CAMPBELL MODEL 412
For fast, quality cuts of mild steel or toughest alloy billets up to 12" x 12" as pictured





Users of Campbell Abrasive Cutting Machines get Tremendous Savings with Fast, Accurate, Quality Cuts of Mild Steel or Toughest Alloys

Write us and we will gladly send you helpful information on the working capacities of the 16 models of CAMPBELL Machines and the CAMPBELL Operating Features that explain the outstanding performance of these machines in cutting a wide variety of shapes and sizes of stock—channels...bars and tubing from the smallest to 14" diameter ...plate up to 4" thick and 20 feet long ...billets up to 12" x 12".

CAMPBELL Machine performance is well illustrated by the **Model 412** pictured above. This machine cuts through 12" x 12" billets of mild steel or toughest alloys (even titanium) in the almost unbelievable time of 6 to 10 seconds per square inch...*with quality cuts.*

Here are some of the operating features that account for comparable speed and quality of cuts by CAMPBELL's 10 high speed production models...two of them fully automatic for highest production.

Oscillation of the Cutting Wheel to maintain cutting speeds and greatly lengthen wheel life is prescribed by CAMPBELL for all solids cuts over 2" in diameter.

Wet Cutting gives maximum assurance of Quality Cuts.

Ample Power, essential to good performance, is supplied for the Model 412 by a 40 HP motor.

Sound Work Holders—essential to accuracy.

For greatest abrasive cutting accuracy, CAMPBELL provides two oscillating machines that rotate the work—round bars or tubing from 3" to 14" diameter.

For further information write for the illustrated Bulletin DH-460-B

ACCO

Campbell Machine Division • AMERICAN CHAIN & CABLE

926 Connecticut Avenue, Bridgeport 2, Connecticut

Use postpaid card. Circle No. 239

Quick-Set Compound Angle Fixture

A combination instrument and machine fixture called the Derry Triangulator offers a quick solution to the time consuming "compound angle" set-up problem. This device consists of two 360 degree protractors set at 90 degrees to each other with sturdy mounting plates top and bottom. By the use of quick release clutches any compound angle on a spherical arc can be quickly set, locked and adjusted to within one minute of arc accuracy.

Triangulator is especially applicable for checking, drilling, grinding, or boring operations requiring repeated set-ups. The device is also valuable for production machine work because of its sturdy construction.

Common axis center-of-gravity rotation—an exclusive feature of the Triangulator—prevents sag or sway by reducing load leverage to a minimum. The instrument-fixture comes in two sizes with 90 degree load capacities of 150 or 300 pounds.

Close-tolerance machined steel worm gears on each protractor, coupled with

clutch type locks, enable the instrument-fixture to positively hold any angles set on the expanded vernier.

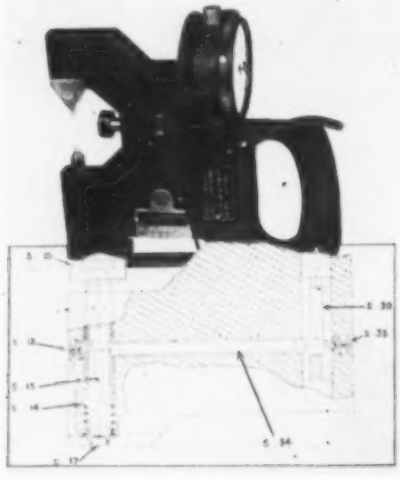
Service & Suppliers, Inc., Glendale, Calif. •

Use postpaid card. Circle No. 110

Shockproof Dial Gage

Dial snap gage, guaranteed shockproof, has been introduced by Jerico, Inc.

Developed by the Nilsson Gage Company, the new Nilco Dial Snap Gage is available with ball point for pitch diameters as shown in the photo, or with a flat carbide anvil as shown in drawing. Patented rotable cam allows the gaging pin to by-pass and prevent damage or injury to the dial indicator mechanism.



Popular uses include complete involute functional inspection of helical or conventional gears, giving accurate readings in tenths with the first application of the gage. No wiggling of the gage is necessary to get the correct reading. The special spring and vernier adjusting nut take all pressure and shock away from the indicating mechanism, assuring trouble free operation. Jerico, Inc., 4744 West Lake Street, Chicago 44, Illinois. •

Use postpaid card. Circle No. 111

WHITNON
Precision SPINDLES

Rated Double A for Absolute Accuracy!

Absolute dependability and balance is assured by dynamic electronic balancer that checks spindles after assembly — to provide the ultimate in on-the-job perfection.

America's finest complete line of Precision High Production Spindles for Boring, Grinding, Milling and Drilling

Whitnon precision Spindles have been developed for new and replacement applications. The extra rigidity from large spring pre-loaded bearings assures constant chatter-free life.

Correct pre-loading mechanisms keep Whitnon Spindles and bearings tight at all times to compensate for changes created by temperature variations and wear.

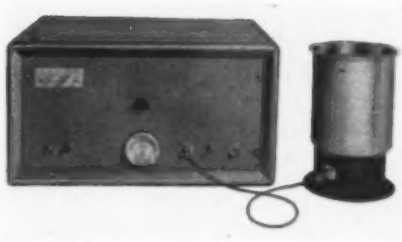
Whitnon Spindles for Milling and Engraving will increase the output of your machines. Whitnon-held tools cut on all lips, hence tools cut better, faster and last longer . . . producing a finer finish.

Whitnon Spindles are built for high speed and long life. Drills stay sharp and produce a straight and round hole.

Write for Literature Today.

THE Whitnon MANUFACTURING COMPANY
ROUTE 6 AND NEW BRITAIN AVE., FARMINGTON, CONNECTICUT

Use postpaid card. Circle No. 240



Alcar ultrasonic cleaning unit.

Ultrasonic Cleaning

A new series of low cost ultrasonic cleaning units, ranging in capacity from two quarts upward, is now available for immediate delivery from Alcar Instruments, Inc. These new units are furnished complete with generator, transducer and tank assembly, and connecting cables.

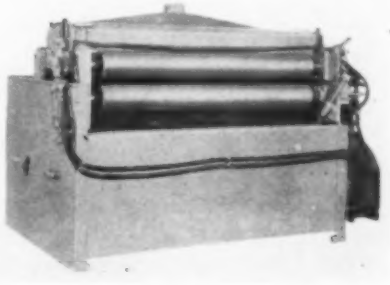
Power output ranges from 50 to 250 watts. Designed for continuous commercial use, the generator supplies the rated output of electrical energy to the transducer. The barium titanate transducer converts the electrical energy to powerful ultrasonic energy, causing cavitation in the solvent which mechanically scrubs parts immersed in the stainless steel tank.

These ultrasonic cleaning units are extremely versatile, yet are simple to operate. A single knob to vary the frequency and a simple on-off switch are the only controls required. A meter measures the output.

Generators are designed to permit use of two cleaning transducers alternately. One tank may be used for removal of excessive amounts of contamination, and the other tank for final cleaning—or two different solutions may be employed.

Alcar Instruments, Inc., 17 Industrial Ave., Little Ferry, N.J. •

Use postpaid card. Circle No. 112



SPEEDSANDER for wood sanding or metal finishing has 34" feeding height built to fit into a conveyorized finishing line and to work in tandem with Model T.O.P. Timesaver Speedsanders for sanding or polishing both sides at one pass. Compact unit also has exclusive automatic belt tracking. Feed speeds available: up to 100 f.p.m.—higher speeds if required. Available in 24", 40", 50" and 60" widths. Timesavers, Inc., Box 7446, Robbinsdale Sta., Minneapolis 22, Minn.

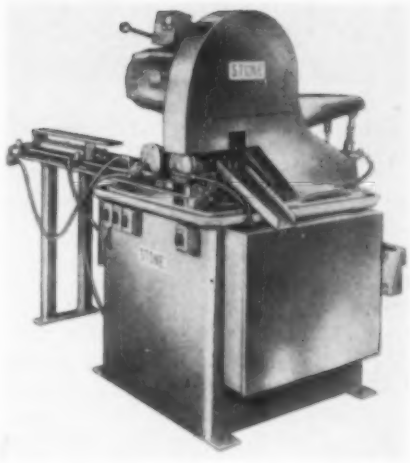
Use postpaid card. Circle No. 113

Cutoff Machine

Stone Machinery Company, Inc., announces a new, more powerful cut-off machine, the fully automatic Model M-100. Powered by a 10 H.P., continuous duty, totally enclosed fan-cooled ball bearing induction type motor, the M-100 cuts ferrous metals with an abrasive wheel and non-ferrous with a saw blade. Tolerances claimed are plus-minus .010" on production runs.

The M-100 has an automatic stock feed accommodating a wide range of shapes, lengths and diameters and will handle any material from aluminum to hardened tool steel. Wheel wear compensator automatically adjusts for faster, more accurate cutting and adds to wheel life.

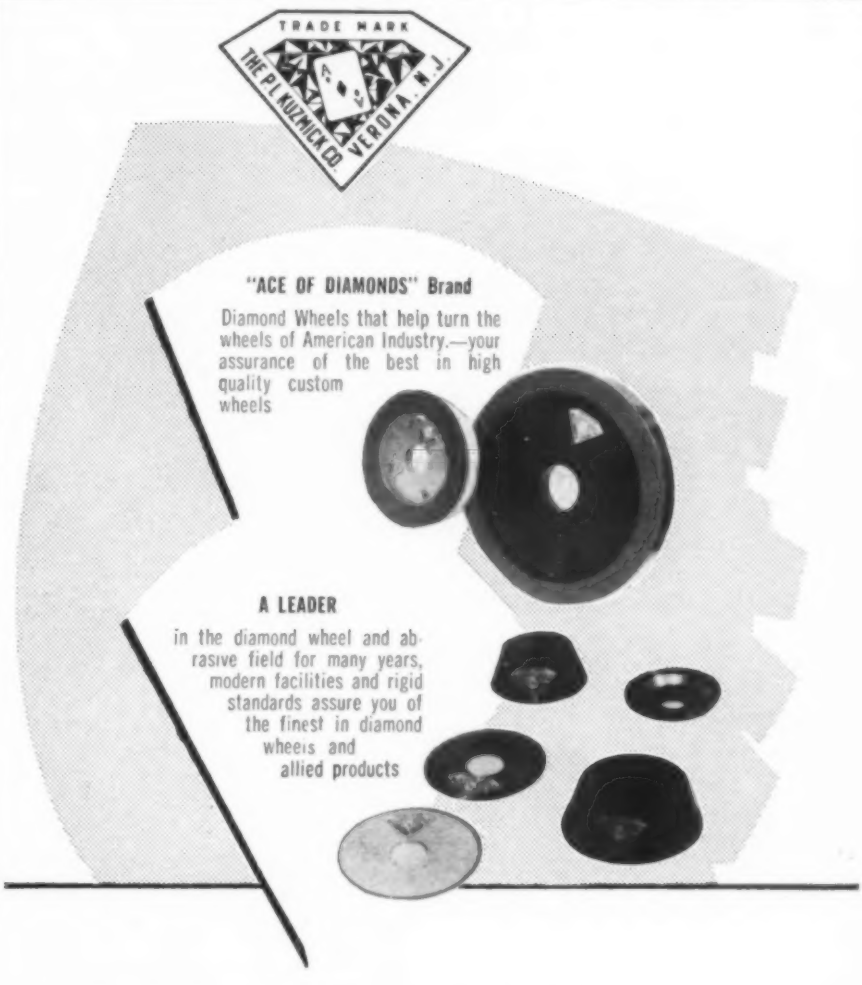
The M-100 may be had for manual or semi-automatic operation and where



greater power is needed, a 15 H.P. motor is available.

Stone Machinery Co., Inc., Manlius, N.Y. •

Use postpaid card. Circle No. 114


TRADE MARK
THE P. L. KUZMICK CO. VERONA, N. J.
"ACE OF DIAMONDS" Brand
Diamond Wheels that help turn the wheels of American Industry.—your assurance of the best in high quality custom wheels
A LEADER
in the diamond wheel and abrasive field for many years, modern facilities and rigid standards assure you of the finest in diamond wheels and allied products

PRODUCTS OF OVER 30 YEARS EXPERIENCE

For longer life, cooler cutting and economy of operation, ACE OF DIAMONDS brand Diamond Wheels are the answer to your grinding problems.

Manufacturers of Diamond Wheels and Tools, Powdered Metals and Allied Products

THE PAUL L. KUZMICK CO.

TELEPHONE: CEnter 9-4602 271-279 GROVE AVE., VERONA, N. J.

Use postpaid card. Circle No. 241

Internal Grinding Attachment for Lathes

This South Bend constant speed precision grinder has been developed to meet the long-felt need for an internal grinding attachment having sufficient power to maintain constant wheel speed under varying loads and to prevent stalling under comparatively heavy cuts.

The South Bend Internal Grinder is powered by a standard type, constant speed, continuous duty 1/6 h.p., 3450 r.p.m., A.C. motor which has proved to be far superior to the universal type A.C.-D.C. motors ordinarily used. The motor is compound belted, through an intermediate shaft, to obtain a quill spindle speed of 30,000 r.p.m. Tests have shown that less than 1000 r.p.m. drop in spindle speed occurs when taking cuts as heavy as .003" on a side in hardened steel.

The grinding wheel and intermediate shaft spindles run on ball bearings which require no adjustment. Oil is effectively sealed in the spindle units, and dust sealed out in such a way that the bearings will retain their precision. The compound belting and the two pulleys are enclosed by a one-piece guard.

Four arbors are supplied, the longest permitting a hole 3⅞" deep to be ground when using a 1-inch wheel. Four grinding wheels for these arbors with 1/4" face; 1/4" bore; and 5/8", ¾", ⅞" and 1" diameters are included. In addition, a ⅛" chuck is supplied so that the various sizes and shapes of mounted grinding wheels may be used and holes down to ⅛" may be ground. Any grit and type of high speed wheel having a ¼" arbor hole or mounted on a ⅛" shaft may be used as required for the material to be ground.

South Bend Lathe Works, South Bend 22, Indiana, U.S.A. •

Use postpaid card. Circle No. 115

Heavy-Duty Dust Collector

Designed to handle heavy-duty continuous grinding and other high dust volume sources is the new Model 123 dust collector, the largest cabinet-type collector now made by Torit Manufacturing Company.

Handling as many as eight grinding wheels at a time, the Model 123 has a dust storage capacity of 10 cubic feet and a filter area of 300 square feet. Its 5 hp motor moves approximately 2000 cubic feet of air per minute through an 8" inlet at speeds of more than a mile a minute. Static pressure for this inlet is 3½" water.

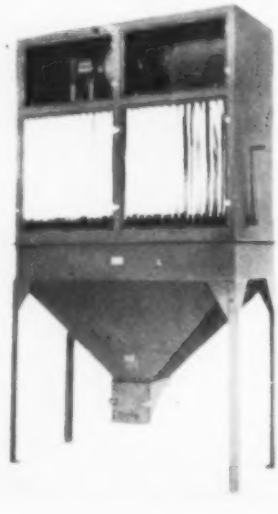
The welded steel cabinet is finished in baked gray enamel, and cloth filters are chemically treated for spark resistance and sealed against leakage. Filters, motor and blowers are easily reachable through removable doors.

As in all Torit cabinet-type collectors, the motor is internally mounted in the clean air stream above the filters for cool, quiet and efficient operation. Manual starter with overload protection is standard equipment, while explosion-proof motors and magnetic starters are available at extra cost. If desired, the collector can be wired through the starter of the machine it serves, saving power by automatically starting and stopping with the machine.

Other specifications: height—115"; width—62¼"; depth—26"; shipping weight—1130 lbs. F.o.b. factory price is $1198.00.

Torit Mfg. Co., 287 Walnut St., St. Paul 2, Minn. •

Use postpaid card. Circle No. 116



A BETTER BACK-UP WHEEL

R57

FOR YOUR ABRASIVE BELTS

45° scoop tooth used for aggressive stock removal

AVAILABLE NOW IN POPULAR 14" DIAMETER SIZES AT BIG SAVINGS

You can get the new R-57 RUBBER CONTACT WHEELS at lower prices in 14" DIAMETER sizes **due to newly developed production techniques. These new wheels have all the well-known features of the R50 and R-54 models.—LONGER BELT LIFE . . . OIL RESISTANT RUBBER . . . WET OR DRY OPERATION . . . HEAT DISSIPATION . . . MAXIMUM SAFETY . . . other features. And what's more these wheels have a 30% trade-in value.

**The new R57 and the R50 and R54 contact wheels are available in many popular sizes . . ½" to 22" DIAMETERS in WIDTHS from 1" to 6". Other wheels made to your specifications in all widths and diameters.

14"

TYPE	WIDTH OF FACE 1"	2"	3"	4"
PLAIN	32.00	34.00	36.00	38.00
SERRATED	37.00	39.00	42.00	44.00

AVAILABLE IN PLAIN OR SERRATED FACE IN ALL DUROMETERS

A WHEEL FOR EVERY OPERATION

Slit Serration	45° Standard	"X" Serration	Cosmo Expander
Aggressive Contact Work	Stock Removal	Moderate Contour Work	Backstand Idler Not Needed

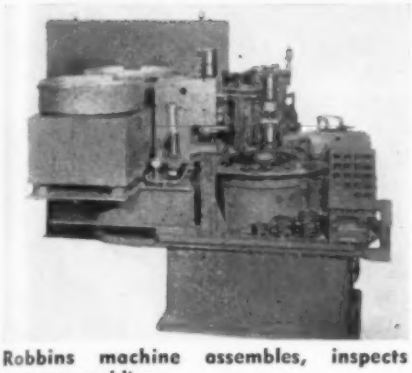
DElta 6-8900

CHICAGO RUBBER COMPANY, INC.

651 MARKET STREET • WAUKEGAN, ILLINOIS

Specializing in Contact Wheels and Industrial and Printers Rolls

Use postpaid card. Circle No. 242



Robbins machine assembles, inspects gear assemblies.

Machine Assembles and Inspects 720 Assemblies Per Hour

Eight-station automatic assembly machine, designed and built by Omer E. Robbins Company, automatically perform multiple operations including press-fit inspection on automatic transmission gear carrier assemblies.

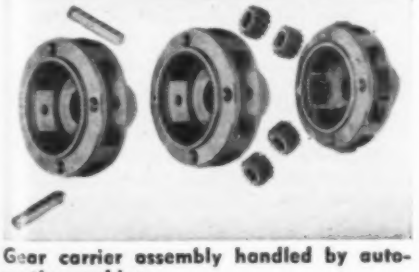
Four pinions with needle bearings and spacers for each are previously assembled into the gear carrier and held in place with dummy pins. These assemblies are manually loaded into the machine. At the first station permanent pins are fed from two vibratory hoppers, shuttled into position, and pressed into the assembly, forcing out the dummy pins. The next station checks the press fit of each pin, automatically informing a built-in memory circuit in the electrical system if a pin does not resist a predetermined pressure. This memory circuit causes defective assemblies to be ejected automatically at the next station. Acceptable assemblies continue without interference through this station to the next, where the pins are staked at each end to make a permanent assembly.

Fixtures float freely over the index table and ride up on stationary anvils at the operating stations, thus eliminating pressure on the index table. Positive alignment is assured at each station by hardened locating pins, which pick up locating bushings in the fixtures. In addition to automatic and manual "Start" and "Stop" buttons, the control panel has buttons which control individual machine movements, as well as offering forward and backward inching control of the table. A red light on the panel flashes whenever an assembly is rejected.

All stations on the machine are hydraulically operated and have complete electrical interlock. Hydraulic and electrical equipment conforms to J.I.C. standards. The machine is normally cycled to complete 720 assemblies per hour at 100 per cent efficiency with manual loading.

Omer E. Robbins Co., 24800 Plymouth Rd., Detroit 39, Mich.

Use postpaid card. Circle No. 117



Gear carrier assembly handled by automatic machine.

Cardboard Tubes Insure Safe Shipment of Grinding Wheels

Safer and more convenient stocks of small grinding wheels may now be maintained in industrial plants as a result of shipment of the abrasives in cardboard tubes similar to conventional mailing containers.

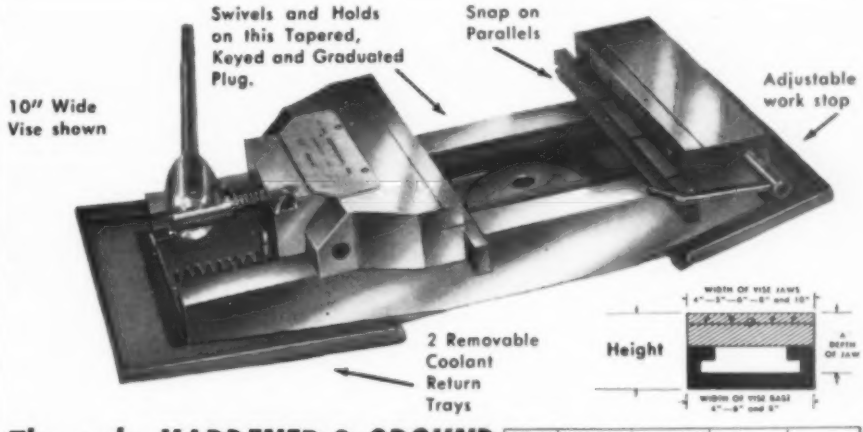
This was reported by packaging experts at Electro Refractories & Abrasives Corp., who said the company is now utilizing the tubes to accommodate wheels up to three inches in diameter. The cardboard containers make for simple removal of one wheel at a time and afford protection against damage on customers' shelves.

Other advantages are easier shipping, faster handling and speedier inventory taking.

Small orders now can be shipped by mail. On larger orders, sealed tubes are stacked on end in shipping containers, saving space. Small grinding wheels formerly were shipped on strings in multiples of ten and packed in sawdust, making for more complicated packing and storing.

Now each cardboard tube is clipped over a stack of ten wheels. Cardboard discs are placed over the ends, then sealed with tapes bearing the company name.

Use postpaid card. Circle No. 118


Swivels and Holds on this Tapered, Keyed and Graduated Plug.
Snap on Parallels
Adjustable work stop
10" Wide Vise shown
2 Removable Coolant Return Trays
Height

The only HARDENED & GROUND
SWIVEL MILLING MACHINE VISE
No Pedestal

WIDTH	OPENING	DEPTH OF JAW	HEIGHT	WEIGHT
4"	6"	2 5/16"	3 1/16"	23 lbs.
5"	8"	2 5/16"	3 1/16"	27 lbs.
6"	9"	2 5/16"	4"	55 lbs.
8"	12"	3 1/16"	4 7/16"	100 lbs.
10"	12"	3 1/16"	4 7/16"	115 lbs.

OPERATOR WILL NOT HAMMER HANDLE

The J&S CLAMPCUT Milling Vise multiplies the clamping and holding power expected of a milling machine vise. The adjustable jaw head and positive down-holding clamping action gives multiplied pressure.

VERSATILE
- Holds out of square and out of parallel rough work pieces
- Adjustable VEE for holding rounds
- Rough work is held vertically

ACCURATE
- Powerful vise allows high accuracy for repetitive positioning
- Adjustable features permit faster better machining
- Mill .0005" parallel, or better

FASTER, EASIER TO OPERATE
- Larger opening
- Adjustable and deburring snap-on parallels
- Trigger opening and closing
- Coolant return trays
- Half the weight of standard vises, yet has twice the opening

Distributors in Principal Cities

J&S TOOL CO. INC. — CLAMPCUT

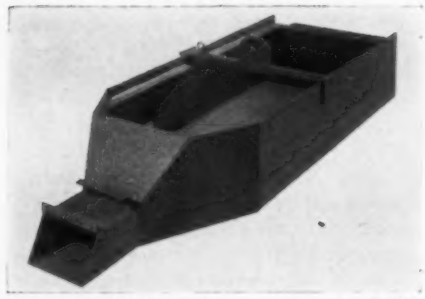
J & S TOOL CO., INC.
880 DORSA AVE.
LIVINGSTON, NEW JERSEY

Use postpaid card. Circle No. 243

Hoist Pans

Hoist pans to expedite loading of abrasive chips and other barrel finishing media are announced by Lord Chemical Corp. The four welded steel pans range in capacity from 4 to 14 cu. ft. All are fabricated from 10-gage sheet steel and fitted with either rollers or roller-bearing wheels. Balanced yoke at top provides for crane or hoist hook.

To secure a chip load, the pan is placed under gate of storage bin. Gate is lifted, admitting chips of selected size into the hoist pan. If a mixture of chips is desired, the pan is rolled from bin to bin until the proper sizes and amounts have been obtained. Pan is then lifted by hoist and carried to the barrel. Its load of chips funnels down a chute at front end through the barrel door, which should be protected by loading guard.



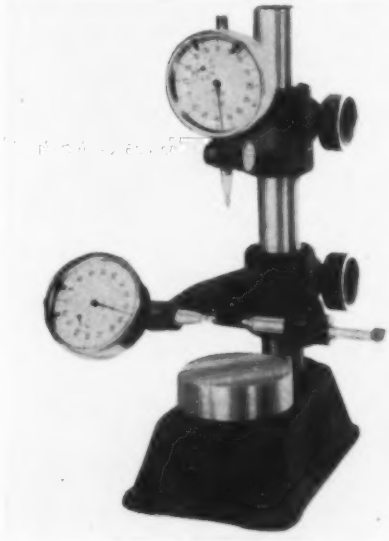
Lorco Model 11 hoist pan, capacity 1400 pounds.

Lord Chemical Corp., York, Penna.•

Use postpaid card. Circle No. 119

NEW COMBINATION of the "Tork-lok" arbor (drawbar model) combines the arbor with a flanged adapter into which is incorporated the actuating mechanism for the arbor. Seven fixtures will be available to cover the range from ½" to 2-9/16". Operations performed with the holding device: drilling, reaming, tapping, milling, surface grinding, gear shaping, gear hobbing, burring, and many others. Fixture has possibilities in automation type units and in built-up gaging units. N. A. Woodworth Co., 1300 East Nine Mile Rd., Detroit 20, Mich.

Use postpaid card. Circle No. 120



DIAL BENCH GAGE—Constructed to permit rough handling, this new dial bench gage now being offered by Air Transport Equipment, Inc., has several outstanding features. Two .0001" dial indicators with revolution counters are supplied. Base is hardened and ground and the column is precision ground. Yoke permits measurements to 2". Priced at $68.50. Engineering Dept., Air Transport Equipment, Inc., Albany Ave., Amityville, L. I., N.Y.

Use postpaid card. Circle No. 121

REDUCE
Precision Hole Grinding Costs
USING AN

Onsrud®
D1-S
HOLE GRINDER

MOUNTED ON YOUR

¼ HP 50,000 RPM AIR TURBINE GRINDER • SLIDE ADJUSTS TO 0.0001"

Grind precision holes at amazingly low costs with the D1-S . . . using your present machine tools. A completely RIGID unit guaranteed not to deflect in its vertical alignment. Grease-shielded, long life bearings. Capacity up to 2¾" diameter with ¾" wheel . . . and up to 4" diameter with adapter. Proper high speed and power for dependable, fast operation with toughest steels.

OR MOUNT ON JIG BORER TO CONVERT MACHINE TO PRECISION JIG GRINDER

ONSRUD MACHINE WORKS, INC.
PORTABLE TOOL DIVISION
3945 PALMER ST., CHICAGO 47, ILL.

WRITE FOR FREE D1-S HOLE GRINDER BULLETIN 1126

Use postpaid card. Circle No. 244

Model OB pump handles lubricating and hydraulic oils at pressures up to 300 psi.

New Pump for Lubricating and Hydraulic Oils

New standard Model OB pumps handle lubricating hydraulic and light fuel oils at pressures up to 300 psi and speeds to 1800 rpm are announced by Sundstrand Hydraulic Division, Sundstrand Machine Tool Co. They are available either as fully standard units for prompt delivery or can be engineered into either existing or new equipment. Where higher speeds—up to 3600 rpm—are needed, modified versions with special gearing are available.

Pumping capacity of the Model OB pumps is 24, 30 or 39 gal per hour with either right or left rotation versions available. Either two-bolt integral mounting or bracket-type mounting may be used, depending on the needs of the specific installations.

Special tooth form of the pumping elements reduces friction and provides positive pumping action that produces a vacuum of 20-25 inches of mercury maximum.

A mirror-lapped, nitroloy seal, flexibly held against a special dry lubricated bronze bushing clamped to the shaft prevents leakage along the shaft. Seal chamber is subjected to inlet pressure only. This design permits simple field replacement if required.

Sundstrand Hydraulic Division, Sundstrand Machine Tool Co., 2210 Harrison Ave., Rockford, Ill. •

Use postpaid card. Circle No. 122

Top-Loading Oven

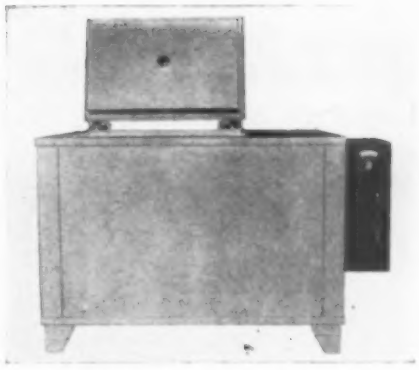
New type oven permits loading and unloading down from the top, either manually or by means of an overhead hoist.

Oven shown has adjustable horizontal air circulation through work space. Work space dimensions are 36″ wide x 24″ front to rear x 30″ from top to bottom. Overall dimensions are 67″ wide x 38″ from front to rear x 44″ high. It is electrically heated.

These ovens are built to individual size requirements. Top opening door may be counterbalanced or not, as required. Ovens may be electrically heated or gas-fired, and can be furnished with either horizontal or vertical recirculating air flow pattern, as required. Insulation is varied to suit the maximum temperature specified.

Pilot lights show when blower and heater circuits are energized. Gas models are supplied with electronic combustion safety controls in conjunction with push-button, electric burner ignition. Temperature controllers are integrally mounted.

The ovens are supplied completely assembled, having been previously tested and adjusted by the manufacturer and ready for operation. They only require connection of the service at the site.



Grieve-Hendry Co., Inc., 1401 W. Carroll Ave., Chicago 7, Ill. •

Use postpaid card. Circle No. 123

DEMAGNETIZATION

Simplified...

WALKER
Compensated Hollow Core Type Demagnetizer is made for a wide range of work — from small screws to large bars — rough finished or finished.
By simply passing work through an aperture it is immediately and completely demagnetized — current rises as work passes through.
Self contained.
Also made for low current line from 2 x 2″ aperture to 14 x 16″.
Larger sizes can be furnished.

O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers and Builders of Magnetic Chucks

Use postpaid card. Circle No. 245

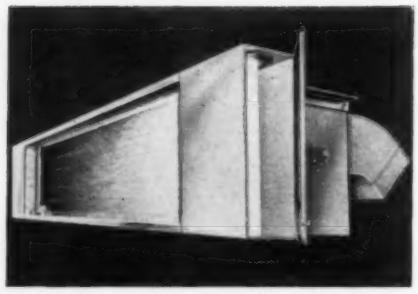
Automatic Air Filtration Adapted to New Herman Nelson Air Handling Units

Automatic air filtration and "once-a-year maintenance" for air handling units has been introduced in American Air Filter Company's new Roll-O-Vent line of industrial unit heaters, heating and ventilating units, and air conditioners.

Automatic filtration is accomplished in all units by use of a continuous glass fibre curtain that moves horizontally through the entering air stream of the unit just ahead of the coils and fan sections. Fresh media is automatically supplied to the air stream by an automatic timer to provide constant filter efficiency and automatic disposal of contaminated media.

Frequent maintenance and replacement of filter media is virtually eliminated by the Roll-O-Vent. Under normal operating conditions, the media would need replacing only once a year. The media is easily disposed of by merely removing the spool of dirty media and replacing it with a new spool of clean media.

Since clean media is periodically introduced, filter resistance remains constant. The density of the Media is graduated by both increasing the number and decreasing the diameter of the



Continuous glass fibre curtain reduces maintenance in Roll-O-Vent air handling units.

fibers from the front to the rear of the mat. This provides progressively more efficient air cleaning and apportions the dust load through the depth of the mat for greater dust holding capacity.

The Roll-O-Vent filtering media is composed of continuous, slightly curled, interlaced glass filaments. These are held in place at every point of contact with a thermosetting plastic bond to form a thick resilient pad or 'blanket'.

These blankets are impregnated with a special non-flammable, jell-like viscosine that is designed to operate at temperatures up to 150 degrees fahrenheit.

The basic Roll-O-Vent unit consists of a fan section, a coil section and the Roll-O-Vent automatic filter. Standard and non-freeze steam coils, are available in a wide variety of sizes and capacities. Various accessories are also available to adapt the units to almost any given field condition. Among these are mixing dampers, face and by-pass dampers, intake dampers and humidifiers.

Dept. P.D., American Air Filter Co., Inc., 215 Central Avenue, Louisville 8, Kentucky. •

Use postpaid card. Circle No. 124

All-Electric Motor Brake

A new, all-electric brake for use on any A-C motor from ¼HP to 250HP and up is now being introduced by the Selenibrake Division of American Rectifier Corporation. Known as a Selenibrake, this newly-developed and improved electrical brake provides a far surer stop than any mechanical brake yet devised. Unlike a mechanical brake, the Selenibrake can repeat its stopping cycle tens of thousands of times without variation in braking torque. This latter feature makes it the ideal unit for all types of machine tools, presses of various types, printing and woodworking equipment, textile and rubber mill equipment, paper slitters and rollers, and a host of other industrial applications where fast, frequent and uniform stops are required.

American Rectifier Corp., 95 Lafayette St., New York 13, N.Y. •

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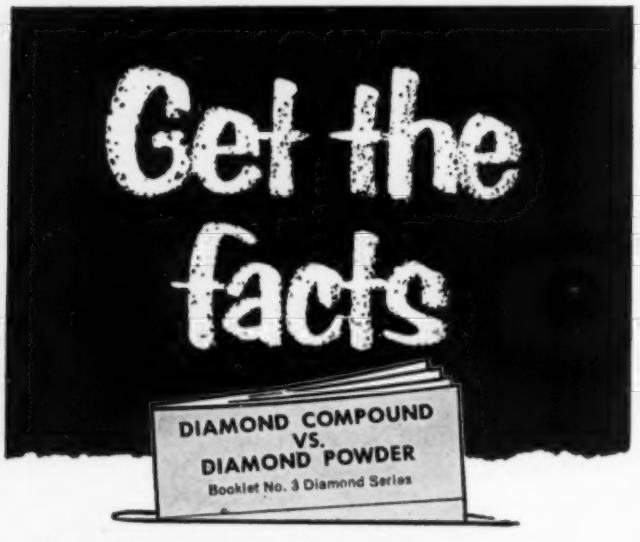


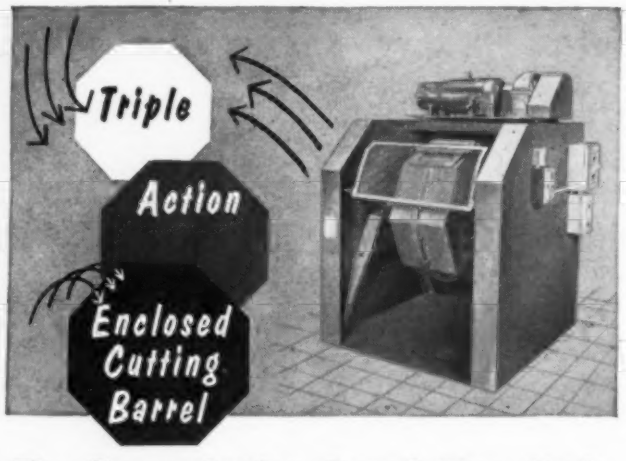
Here is an interesting, straight-forward discussion of diamond abrasives used for polishing and finishing operations. The facts and figures presented are important to anyone producing fine finishes on hard materials . . . in mold polishing, production line finishing or die polishing.

Get your free copy

...read it and pass it along to your associates. Write today:

Abrasives Division
ELGIN NATIONAL WATCH COMPANY
Dept. A-1 ELGIN, ILLINOIS

Use postpaid card. Circle No. 246



The Finest Cutting Barrel Ever Made

Hartford's great new enclosed barrel speeds deburring, descaling, polishing on screw machine parts, stampings, and castings. Hartford's unique *Triple Cutting Action* produces the highest degree of uniformity . . . faster . . . at lower cost. Extremely compact with every modern feature for efficiency, safety, and cleanliness. Available in 4 and 10 cu. ft. barrel capacities. Write for complete literature.

Hartford
PRECISION BALLS • RETAINERS
BEARINGS • TUMBLING BARRELS
Hartford Steel Ball Co., Inc., 21 Jefferson, W. Hartford 6, Conn.

Use postpaid card. Circle No. 247

Bush TTS-2500 table tongue sander.

Table Tongue Sander

Latest addition to the Bush line of abrasive belt machines is the model TTS-2500 Table Tongue Sander embodying several new features.

With table tilt 45 degrees either to front or rear for predetermined I. D. or O. D. angular grinding or deburring, grinding belt head with 6" vertical adjustment using 90 inch abrasive belt ranging from ¼" to 2" wide. 26 contact wheels ranging from ¼" wide, ⅜" dia. to 2¼" wide, 3" dia. have been developed for this machine. Also range of platens for each width of belt. Abrasive belt tension automatically controlled. Table size 24" x 24" with positive tilt lock and shock mounting.

Bush Mfg. Co., 909 Rochester Rd., Clawson, Mich. •

Use postpaid card. Circle No. 126

New Line of Face Shields

This new Musketeer "headrest" carries a choice of four types of face shield visors which fasten to the front of a wide spark deflector, pivoted to the headband.

Headband and adjustable cross strap are one-piece molded nylon. Headband is fitted to the head by a large, winged knob and gear, also of nylon, while wearing the shield. Nylon friction pivots also adjust while the shield is in use, locking it in any position or allowing free up and down movement.

Face shields available in four styles.

The Musketeer is available with: (left) a fiber visor with welding lens for scarfing, furnace work and heavy gas welding. Also (2) a metal-bound plastic visor in various depths, and (3) a wider, all-plastic visor, both in clear plastic and in shades of green, for use in metal pouring and finishing, spot and flash welding, woodworking, etc. At the right is a 24-mesh wire screen visor, recommended for furnace work and drop forging.

Jackson Products (Air Reduction Sales Co., a division of Air Reduction Co., Inc.), Warren, Mich. •

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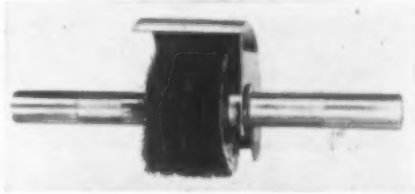
HERE'S YOUR ANSWER TO GRINDING STANDARDS

. . . conclusive proof that grinding operations can be time-studied and that standard data is as practical for grinding as any other operation is now yours.

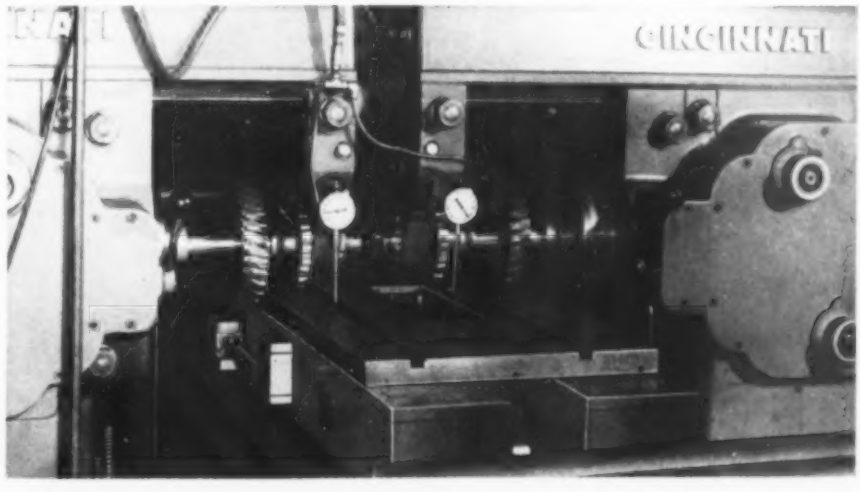
Your complete guide in establishing your own grinding standards which will help you prepare accurate production costs and estimates can be had by sending $1.00 to:

"Developing STANDARD TIME DATA for Grinding Operations"
GRINDING and FINISHING
Hitchcock Publishing Company
Wheaton, Illinois

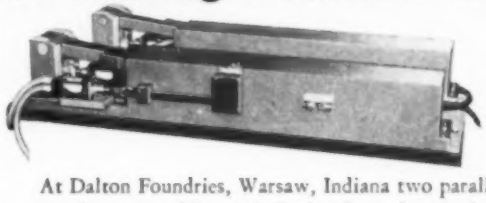


ABRASIVE BELT CLEANER — Hapomit Cleaner, of West European origin, is now available in this country. Hand tool restores cutting power of clogged abrasive belts, and increases their useful life by 30%. Rotating steel wire brush takes all waste material out of even heavily clogged belts in a few seconds. Price about $13. Henley & Co., Inc., 27 Spruce St., New York 38, N.Y.

Use postpaid card. Circle No. 128



AUTOMATIC HOLDING AND UNLOADING of milling machine made possible by

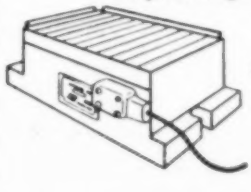


MAGNA-LOCK electro-magnetic CHUCKS

At Dalton Foundries, Warsaw, Indiana two parallel mounted Magna-Lock chucks hold cast iron saw tables while both sides and two miter slots are milled in one pass. Chucks are equipped with air-actuated disappearing end stops and work locator cycled with the milling machine, providing automatic holding and unloading of the work-pieces which are carried to the machine by a roller conveyor. The Magna-Lock chuck setup adjusts to four different saw table sizes and replaces time-consuming clamp-type fixtures.

This is just one more of scores of examples of how Magna-Lock electro-magnetic chucks and Magna-Lock engineering ingenuity are solving holding problems, cutting costs. It will pay *you*, too, to consult Magna-Lock. Just write Dept. GF 77.

Request Magna-Lock as original equipment on your new machines.



Hanchett **MAGNA-LOCK CORPORATION**
BIG RAPIDS, MICHIGAN, U. S. A.
designers and makers of a complete line of magnetic chucks and devices.

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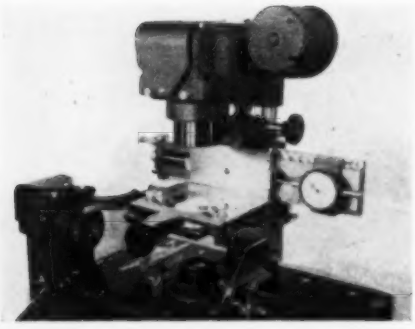

Surface Illuminator Attachment

Surface Illuminator Attachment for use on Portman Optical Comparators, as well as other makes of Comparators has been introduced by the Portman Instrument Company, Inc., New Rochelle, N.Y.

This attachment consists of a lamp housing containing an illuminating lens system and high intensity projection lamp, and a pair of reflecting mirrors and brackets. Two reflecting mirrors are used in parallel. The first mirror reflects the light on the part and the second mirror returns the beam. Therefore the light does not stray.

Surface illumination on an optical comparator is necessary when the part to be inspected is of a shape which cannot be projected by the shadow outline or silhouette method. Parts such as punch ends, die cavities, etc., have to be projected by illuminating the surface of the part on the screen of the comparator. The surface of the part is magnified on the screen to the exact size of the magnification lens used on the comparator.

The Surface Illuminator can also be used in conjunction with the conventional projection system of the comparator. This method eliminates ghosts which sometimes appear on certain shapes of parts when projected by the shadow method alone.

Portman Instrument Co., Inc., Town Dock Road, New Rochelle, N.Y. •

Use postpaid card. Circle No. 129

Flat Ground Die Steel

Heller Tool Company, Newcomerstown, Ohio, has introduced a complete new line of more than 1300 standard stock sizes of flat ground die steel for a wide variety of tool and die applications. Both the oil hardening and air hardening analyses are recommended by leading consulting metallurgists.

Heller Nucut Die Steel features a surface-finish of 25-35 micro-inches, easy machinability and wide hardening ranges. Surfaces, ready for immediate layout, are protected in shipment and storage by special packaging which includes complete heat-treating directions.

The oil hardening type is a high grade molybdenum alloy tool steel. It is spheroidize annealed for easy machinability. Wide hardening range permits heat treatment with the simplest of equipment. Rockwell C hardness of 64-65 may be achieved by hardening the range of 1450 to 1540° F. Heller oil hardening flat ground die steel may be used for a wide variety of tool-making jobs such as dies, jigs, punches, templates, gauges, small tools, etc.

The Air Hardening type is a 5% chrome alloy. This analysis provides a high degree of wear resistance as well as wide hardening range. Tools made from this steel are particularly suited to punching silicon or stainless steels, Monel and other abrasive metals, or for long production runs where the tool must be kept in service without frequent sharpening. Hardness of Rockwell C 63-65 is achieved within a temperature range of 1700 to 1800° F.

The oil hardening type is available in 18″ and 36″ lengths, in widths from 1/64″ to 14″, as well as in a wide variety of stock sizes. Air hardening type comes in 36″ lengths in a wide range of widths and thicknesses, including squares.

Heller Tool Company, Newcomerstown, Ohio. •

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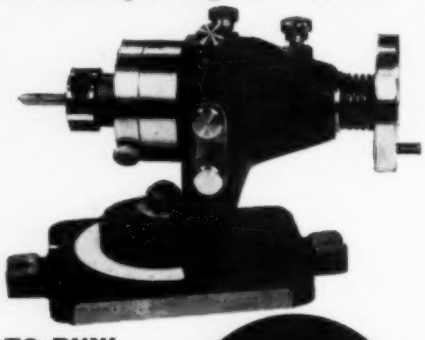
The "R & A"
HIGH QUALITY PRECISION
TAP GRINDER

Makes Grinding A Tap As Easy As Sharpening A Pencil!

Has All the Money-Saving Features of Higher Priced Machines!

Grinds and Relieves Chamfers of any Tap, Right or Left, up to ⅜".



- NO COLLETS TO BUY!
- NO CAMS TO CHANGE!
- CAN BE USED ON ANY GRINDING MACHINE!
- PROVIDES UNIFORMITY FOR LONG PRODUCTION RUNS!

LOWEST PRICE EVER! $195

Write for Bulletin Number 24

R & A MACHINE CO., Inc.
100 GROVE ST. WORCESTER 5, MASS.

Use postpaid card. Circle No. 249

NEW HEAVY-DUTY BARREL FINISHING MACHINE SPEEDS PARTS OUTPUT

16 cu. ft. capacity with 1 to 4 compartments

FEATURES

- Direct belt and gear drive without chains and sprockets. Variable speed 8 to 25 rpm.
- Interchangeable barrels to fit any desired compartment make-up.
- Rugged, heavy-duty construction; No-Seam Vinyl-lined barrels.

USE MODEL V-16. Speed finishing work. Cut parts handling costs on small lots or continuous runs. Select individual barrel sizes to fit any desired combination of compartments. The V-16 Precision Barrel Finishing machine has many versatile features to meet your specific needs, assuring maximum output at lower cost. Engineering design is outstanding.

FULL DETAILS are available in new catalog data sheet "V-16". Write for your copy today.

RAMPE MANUFACTURING CO.
14915 WOODWORTH AVE., CLEVELAND 10, OHIO

BARREL FINISHERS • SCREEN SEPARATORS • COMPOUNDS • NYLASLUGS

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News of Industry

WORLD'S LARGEST FILTRATION UNIT, designed by the U.S. Hoffman Machinery Corp., on its way from Mt. Pleasant, Mich., to the new Ford plant in Indianapolis, Ind. The unit is so large that it is being shipped in three sections. Assembled, it will serve 41 thread grinders and will be 54 ft. long, 9 ft. wide, and 7 ft., 6 in. deep. The flow rate will be 1500 gallons per minute—in excess of a small river.

'58 ASTE Show

Announcement of plans for its 1958 Tool Show has just been made by the American Society of Tool Engineers. Site of the '58 Show will be Philadelphia's Convention Center, which last hosted the event in 1954.

The 1958 ASTE Tool Show will be open seven working days from May 1-8 (closed Sunday) from 9:00-6:00 p.m. A complete integrated technical program of papers, panels, seminars, plant tours and related activities will also be offered as in the past. •

Company Briefs

The **Ernest E. Diener Company,** 4779 Korte Avenue, Dearborn, Michigan, has been appointed sales representative for the eastern half of the state of Michigan by **Size Control Company** of Chicago. Size Control manufactures such products as reversible plain plug gages, reversible thread plug gages and centerless lapping machines.

The **Maserati Corporation of America** has moved to new and larger quarters at 46 Sea Cliff Avenue, Glen Cove, L.I. to accommodate an increased stock of machine tool equipment, parts and demonstration units.

The formation of a new subsidiary named **Eaton Research and Development Company** has been announced by **Eaton Metal Products Company** of Denver, one of the west's largest fabricators of pressure vessels, tanks and specialty metal products. Primary purpose of the new company will be to engage in research and development work in chemical and mechanical engineering, physics and related fields of science for private industry and agencies of the federal government. Scientific staff is headed by **Dr. William R. Jewell,** president, and **Dr. Robert A. Fisher,** head of chemical engineering.

Rex Tool Co., Inc., Milwaukee, specialists on tools and abrasives, has been named to handle Electro Refractories & Abrasives Co. wheel sales in Milwaukee and environs.

E. F. Houghton & Co., oil, chemical and packing manufacturers, Philadelphia, has announced expansion of its manufacturing facilities in Detroit, more than doubling the plant size.

Plans have been drawn and bids are being obtained for new factory, office and laboratory space adjoining the present location at Lumpkin Ave. and Detroit Terminal R.R.

SOVIET THREAD GRINDER—Designed to grind precision instrument parts, this universal thread grinder was recently introduced in Russia by the Moscow Intergrinding machine tool works. Machine can grind screw pitches ranging from 0.25 mm to 60 mm. A microscope mounted on the machine aids in checking accuracy and surface finish. It is claimed that many "design improvements cut the time needed for subsidiary operations." (Sovfoto)

Flexible shaft division of **Robertshaw-Fulton Controls Co.** has moved to a new and larger manufacturing plant in Chatham, N.J. The division was acquired recently by Robertshaw-Fulton as part of the Acro Mfg. Co., Columbus, O. It was formerly known as the WKT Corp. and occupied a plant in Plainfield, N.J.

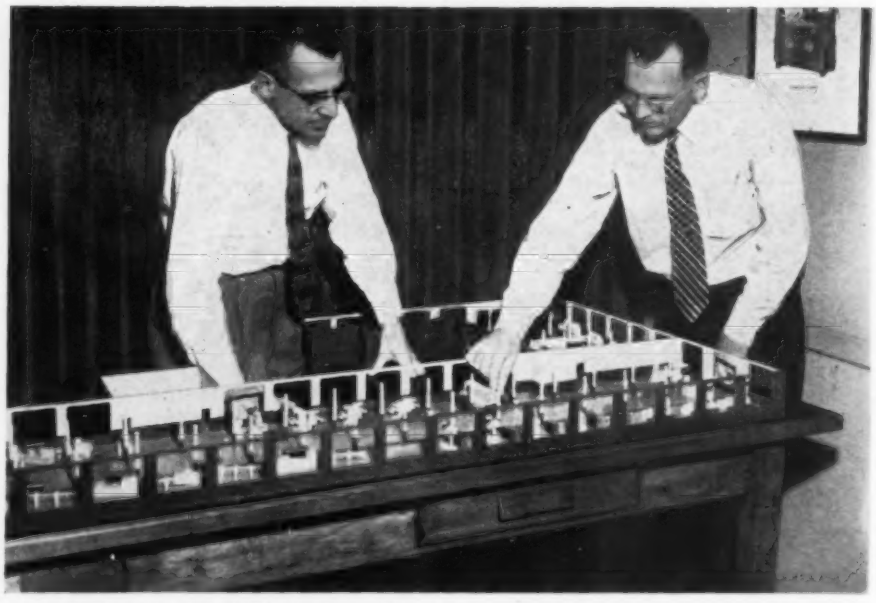
NEWS OF INDUSTRY *continued*

The Timken Roller Bearing Co. is constructing a new engineering building at the corner of Dueber Ave. and 19th St., Canton, O. The building will measure 120 by 140 and will contain three floors. First floor of the building will be occupied by the records and archives department while the top two floors will be occupied by the engineering departments. Cost is estimated to exceed one million dollars.

U.S. Delegates **Paul V. Miller,** manager of the Taft-Peirce Small Tool Div., and **Spencer Terry** of the United States Defense Dept. attended the convention of the International Organization for Standardization (I.S.O.) which was held in Lisbon, Portugal, May 2-4. They served on I.S.O. Technical Committee No. 1 to present the Unified screw thread system for adoption by other countries as part of a world standard. The Unified system was adopted by Great Britain, Canada, and the U.S. a number of years ago, but has not been finally accepted by European I.S.O. nations who use the Metric screw thread system exclusively.

Southern Tool Distributing Co., Atlanta, Ga., was recently appointed an authorized cutting tool distributor by **General Electric's Metallurgical Products Dept.,** Detroit, producers of cemented carbide cutting tools.

Pratt & Whitney Co. Inc., has announced a major expansion of its Rochester, N.Y., branch office facilities. The office will move on July 1 to modern, enlarged quarters in the new Linden Industrial Park area of Rochester.



MAJOR PLANT EXPANSION planned by Moore Special Tool Co., Inc., for late this year should enable the Bridgeport, Conn., machine tool manufacturer to cut down its heavy backlog of orders for jig borers, jig grinders and other toolroom equipment. Occupation of a 74,600-square-foot, two-story building adjoining the present Moore plant will bring total plant area to 122,600 square feet. William Johnson, left, secretary of the company, and Richard F. Moore, president, refer to plant layout model of first floor of recently-acquired addition.

new model S-DD

DOUBLE DISC GRINDER

Saves Time...

Saves Space..

Saves Money

Apex DISC GRINDERS

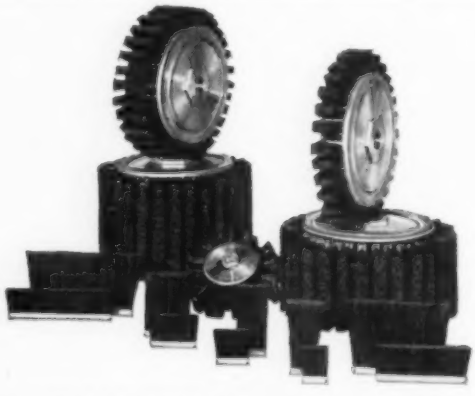
Here is the all new Apex Model S-DD Disc Grinder that gives you double duty performance—lets you rough grind on one side, finish on the other—saves floor space required for a second machine—reduces "down-time" for disc changing—lowers your investment cost by doing two jobs with one machine.

Available in 15", 16" and 20" disc sizes, Model S-DD offers fully adjustable tables that move up and down, tilt accurately and automatically level. Write today for complete information on the new Apex Model S-DD grinder.

Dealer Inquiries Invited

Rankin Bros. ENGINEERING & SALES, INC.
11090 S. ALAMEDA ST. LYNWOOD, CALIF.

Use postpaid card. Circle No. 251



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The Bechtel Corp., San Francisco and New York, has been awarded the engineering and construction contract for the new $88,000,000 Reynolds Metals Co. aluminum reduction plant at Massena, N.Y. Grading and site preparation for the new 100,000-ton reduction plant on the St. Lawrence Seaway will begin immediately. It is anticipated that this first phase of construction, as well as some partial foundation work, will be completed before winter. The first buildings to be erected on the 1700-acre site will be a machine shop and office building. The project is scheduled for completion by November 1, 1959.

Personnel Briefs

Elmer T. Gustafson has been appointed vice president and general manager of sales of Ceco Steel Products Corp., Chicago. Gustafson replaces **Harold D. Jolley** as general manager of sales. Jolley remains as senior vice president with special assignments, reporting directly to the president.

George R. Wernisch, eastern regional manager, has been appointed vice president in charge of the structural products division, replacing Gustafson.

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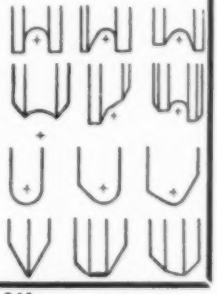

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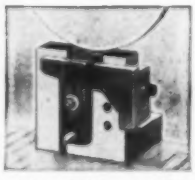

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Verne E. Minich, founder of the Wheelabrator Corp., Mishawaka, Ind. (1908), was recently made honorary chairman of the Board; **Otto A. Pfaff** was elected chairman of the Board. Pfaff will continue to serve as president, a position he has held since 1941.

James W. Charbonnier has been appointed director of industrial and plant engineering of the Black & Decker Mfg. Co., Towson, Md. **Drummond R. Stuart** has been named general manager of the company's Canadian subsidiary, Black & Decker Mfg. Co., Ltd., Brockville, Ontario.

Edward J. Ferris, Jr., has been promoted to factory manager of the Machinery Div. of Pratt & Whitney Co. Inc., West Hartford, Conn.

R. M. Critchfield, General Motors vice president in charge of Process Development Staff, has announced appointment of **C. A. Nichols** as his technical assistant. **Nichols** comes to the Technical Center from Delco-Remy Division, Anderson, Indiana, where he was director of manufacturing facilities.

Samuel A. Glueck (left), general mgr., Midwestern Dept., Federated Metals Div., American Smelting & Refining Co. Right, Louis D. Alpert, gen. mgr., Eastern Dept.

Samuel A. Glueck, former general manager of the Eastern Dept. of Federated Metals Div., American Smelting and Refining Co., has been named general manager of the Midwestern Dept. **Louis D. Alpert,** manager of Federated's Los Angeles plant, has been appointed general manager of the Eastern Dept.

Charles W. Darby has been appointed to the newly created position of production manager of the spring div., Crucible Steel Co. of America, Pittsburgh.

George E. McDonald has been appointed vice president and treasurer of the Walworth Company, manufacturer of valves and fittings.

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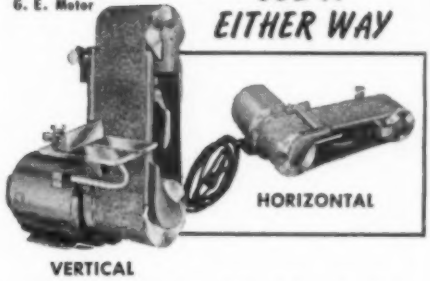

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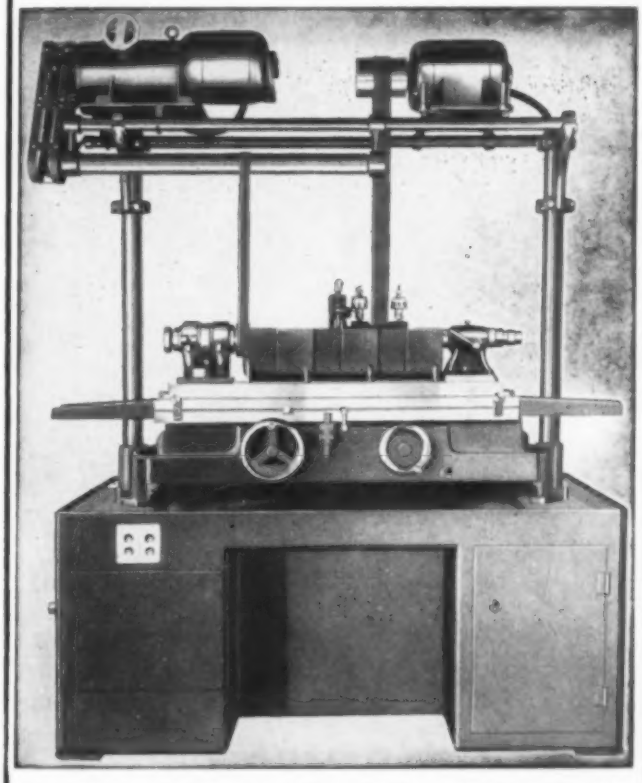

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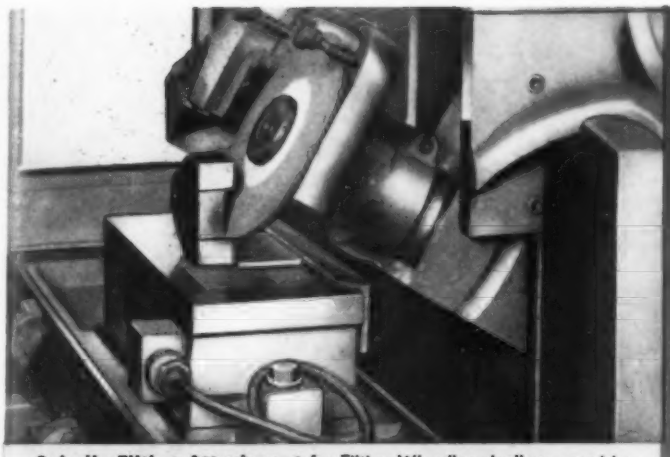

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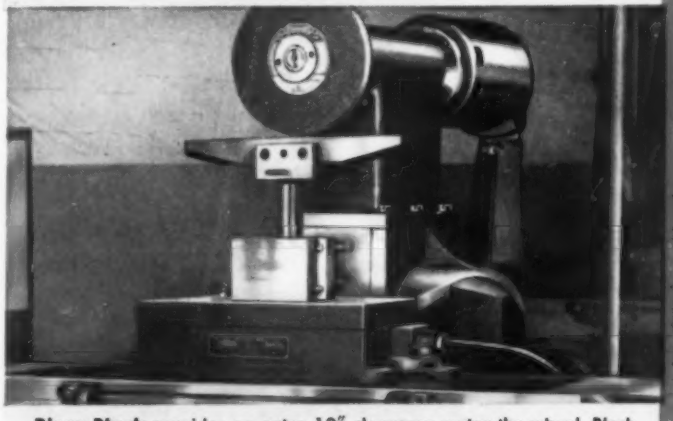

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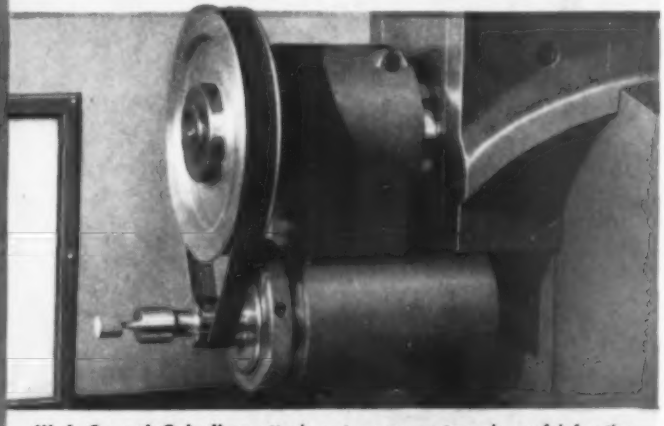

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